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AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

JUNE, 1836.


## Practical and Theoretical Mechanics.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

*Remarks on Suggestions, by Mr. Perkins, in regard to the Explosions of Steam Boilers.* By a CORRESPONDENT.

There are few subjects of practical science in regard to which the public at large have so deep a stake, as in the determination of the causes of the explosion of steam boilers. And I might add, that there are very few subjects, in relation to which the public require, as yet, more enlightening. Hardly a month passes without some *new boiler* being produced, to be perfectly free from the danger of explosion, and, up to this time, each project has proved an illusion. While the public are thus alternately excited and depressed, practical men neglect even a trial of the various means proposed to render existing boilers more safe, and, without exertion, look on, seeming to consider all devices as alike to be condemned. This state of things is, no doubt, in great part, produced by a want of information in regard to the causes of explosion.

One of the first attempts, on a scale of any magnitude, to remove the existing ignorance on this subject, by experiments, originated with the Franklin Institute; and their committee on the explosions of steam boilers have obviously devoted much time and attention to the researches, which

they were enabled by the government to make,* on the dangers to which steam boilers are supposed to be liable.

We have a most interesting fruit from the experiments of this committee, in their immediate application to test a theory of explosions recently advanced by our countryman, Perkins, whose name has been so celebrated in this branch of practical science. The theory to which I refer is an extension and modification of the one formerly advanced by him.

This new theory, or rather the causes which he assigns for the explosions of boilers, and those which he rejects as not producing such an effect, will be found stated in the first number of the Magazine of Popular Science, recently issued in London. The paper purports to be on the subject of a new steam boiler, which is to be free from the danger of explosion.

The ideas of Mr. Perkins will, no doubt, have considerable weight, and, if any of them shall prove erroneous, will, by turning attention away from what *may* be causes of explosion, to what are certainly not, or the reverse, be productive of mischief. The truth or fallacy of most of his suggestions, may be tested by the experiments of the committee before referred to, which, if they had been devised to meet the case, could not have been more direct. I propose, in the following remarks, to point out the bearing of these results.

Mr. Perkins remarks, that, to show why his boiler will be free from explosion, the causes of these accidents must be described. He adds:

"The *first*, and most common cause, is from the pressure of common steam. What is meant by common, or pure steam, is such as has not been suddenly elevated, or such as is not compounded with an explosive mixture, by the improper management of the boiler."

"The first kind of explosion is harmless, as the boiler simply rends, or gives way, in the weakest place, caused from wear, or some defective spot."

That a boiler cannot be exploded by gradual increase of pressure, seems to have been a favourite idea with more than one author, and, indeed, our western engineers have almost made a proverb of it. That the committee, to whose labours I have referred above, entertained a doubt on this head, is obvious from their eighth subject of inquiry, which runs thus.†

VIII. To observe, accurately, the sort of bursting produced by a gradual increase of pressure within cylinders of iron and copper.

They burst one cylinder of iron, and one of copper, by a gradual increase of pressure, and, in both cases, produced a true *explosion*. The cylinders did not simply rend in a weak spot, but "*exploded violently*." The cuts‡ accompanying the statements to which I refer, show how violent this action was. The head of one of the cylinders, the iron one, was thrown to the distance of fifteen feet; the other parts of the boiler, about six feet. Both the heads of the boiler were indented by striking against the iron cylinder in which the fire was made. The copper cylinder was rent in the direction of its length, and singularly doubled and indented by the violence of the explosion. The noise attending its explosion, is described by the committee as "like that from the firing of an eight inch mortar."

* See the report of the Committee of the Franklin Institute, &c., Part I., published in this Journal, in January, February, March, April, and May, and in the documents of the Congress of the United States.

† Jour. Frank. Inst., vol. XVII., p. 223.

‡ Ibid., p. 224, and 225.

It is, then, conclusively shown, by these experiments, that Mr. Perkins is in error in his position; an error the more important, that it must bring in its train, inattention to regulating the pressure within a boiler, a belief in the safety of tying down, or overloading, a *safety valve*, and the like. Keep only the supply of water, and never mind the pressure, is the maxim which it inculcates; the worst that can happen, if the boiler gives way, is a simple rent in some weak spot; and, as a deduction, if there are no *weak* spots, the boiler will bear all that can be put upon it. This idea is of most mischievous tendency, and its spreading cannot be too soon checked.

Mr. Perkins next proceeds to the second cause of explosion. "The *second* cause of explosion, which I some years since accidentally discovered and published, and which explanation has since been experimentally proved to be correct, by the celebrated French philosopher, M. Arago, arises from the water getting too low in the boiler. The fire then impinging on that part of the boiler which is above the water, causes the heat to be taken up by the steam, which rises by its superior levity to the top of the boiler, causing it sometimes to become red hot, and so elevating the steam to a much higher temperature than its pressure would indicate. Now when the boiler is in this state, and the safety valve suddenly raised, the water will be relieved from the steam pressure, and rush up amongst the surcharged steam, which thus receives its proper dose of water, at the same time that part of the boiler which has been raised in temperature, giving off its heat to the water so elevated, steam is generated in an instant, of such force as no boiler hitherto made can resist. This kind of explosion has of late years been very frequent and disastrous, particularly in America."

There are so many assertions made in the paragraph just given, that it may be well to recapitulate them.

It is stated as a fact that explosions arise from the water getting too low in a boiler. That the reason why explosion takes place, is that the boiler is heated unduly, producing surcharged steam. That by raising the safety valve, water is thrown into the surcharged steam, and upon the hot metal; receiving heat from both, it is flashed into explosive steam.

That water may get too low in a boiler may readily be granted; then as to the consequences, we have the theory of Mr. Perkins, and the experiments of the committee before referred to. It may seem at first a matter of no great importance whether the hot steam or the hot metal flash the water into steam. It is the hot metal which is the source of the danger. But this will not bear examination, for among other reasons why we should be explicit upon this head, the temperature which may be reached without danger in the two cases, may be very different. Besides, if hot and unsaturated steam collected near the top of a boiler, is absolutely a necessary consequence of unduly heated metal, we may perhaps apply more simple means to determine the existence of danger, than when we are to determine the temperature of the metal of the boiler.

It was first shown by Dulong as a consequence of received laws of heat and vapour, that water thrown into hot and unsaturated steam, would not produce highly elastic steam. Others have repeated the proofs, but still practical men have doubted, probably overlooking the fact that these laws of heat are deductions from experiment, and therefore have all the authority of experiment. But the committee on explosions have made the direct experiment, and it tallies entirely with theory, so called. They raised* steam to 533° of Fahrenheit's thermometer, when if "common steam," it

*See Report at page 19, vol. XVII. Journ. Frank. Inst.

would have had a pressure of more than sixty atmospheres, but not having a full supply of moisture, its pressure was less than seven atmospheres. They injected fourteen ounces of water into this steam, which so far from flashing into highly elastic steam, lowered the pressure to six and a half atmospheres. This is one of many conclusive experiments leading to the same result. Hot and unsaturated steam then cannot *become* dangerously elastic by the projection of water into it.

If I understand Mr. Perkins aright in his statement respecting M. Arago, he certainly is in error. It is stated in the paper on explosions, by that philosopher, that his experiments referred to an increase of elastic force, within a boiler, accompanying the opening of a safety valve, and that in all the cases which he tried, there was a *decrease*, not an *increase* of pressure attending the opening. He however admits that his experiments were inconclusive, inasmuch as the boilers were not probably unduly heated. He further states that a decisive experiment was made by M. M. Tabareau and Rey on this subject, in which a boiler was unduly heated, and an increased pressure resulted from opening a safety valve. I shall resume this subject, having for the present occupied as much space as you will be disposed to devote to me. I consider the inaccuracy of two of Mr. Perkins's statements as proved by reference to the direct experiments of the Committee of the Franklin Institute.

First. That a gradual increase of pressure within a steam-boiler cannot produce all the most violent effects of explosion.

Second. That the projection of water into hot and unsaturated steam can produce highly elastic, or explosive steam.

Yours, &c.

A.

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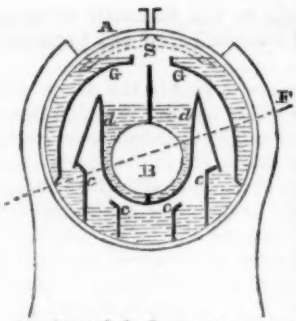
## *Suggestions of Means calculated to promote Safety in Steam-Boat Boilers.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

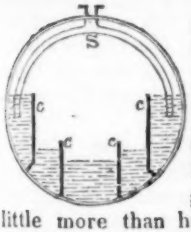
The steam-engine has, no doubt, been retarded in its race of usefulness, and in its applicability to the mechanic arts, by its liability to explosions, accompanied as this accident usually is, by so great a sacrifice of life and property. The existence of so great an evil should induce mechanical and scientific men to seek untiringly for the means of remedying so dangerous a defect. With this view of the importance of any proposed plan of prevention, which may appear feasible, I venture to offer some suggestions on this subject, merely premising that they are given to the public with much diffidence, but still with the hope that they may not be without value.

Many of the explosions of steam-boat boilers that have occurred, especially on the Mississippi, have been attributed to their internal flues, or furnaces, which becoming uncovered with water, by the rolling or continued leaning of the vessel, are rendered red hot, and produce that terrible effect of explosion, which seems to be so generally produced, when iron becomes thus heated, in the presence of water and steam confined. The following is a method proposed for keeping the whole fire-surface safely covered, by a quantity of water, which would be dangerously small, in a common boiler of the same extent of fire surface.




A is an end view of a cylindrical boiler set in a furnace; B is the internal flue passing through from end to end; *c c c c* are upright partitions of thin copper, united water tight to the bottom and ends of the boiler; *d d* represents a semicircular jacket or reservoir, enclosing the flue B, and likewise united water tight to the ends of the boiler; G G are other partitions, forming reservoirs for water against the sides of the boiler. Now the action, it is supposed, will be this: the water passing through the two branches of the supply pipe S, overflows the two reservoirs G G, and falls ver into *d d;* from this it runs down the inclined ledges into the side reservoirs *c c*, and so on to its lowest level. The imaginary line F shows the level which a steam-boat might assume, in a heavy gale, without uncovering any of the fire surface of water. In this position all the cells would be still supplied with water.

This description and drawing is here given, to show the extent to which the principle might be applied, although I am aware, that in practice it might be of doubtful success, except in large boilers, owing to its complicated internal construction, and the difficulty of cleaning when it had become foul from the saline matters of the water. With this view I proceed to describe a more simple arrangement. The figure represents the several metal divisions *c c c c*, and the branches of the supply pipe S.



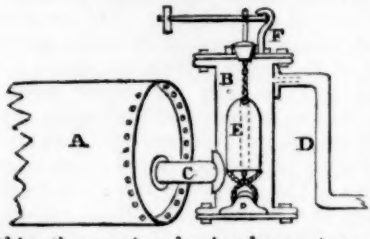

In boilers already in use, I conceive it would add to their safety, to place a single partition up the centre to the heighth of about two-thirds of the diameter, with branches to the supply pipe. It would not, however, furnish the advantages shown in fig. 2, where the same generating surface is obtained from water occupying but little more than half its natural space; and this gain in space adds about one-fourth to the room for the accumulating steam. It might be asked why the placing of a semi-cylinder within the boiler, and a few inches distant from the fire surface,* would not give all the advantages to result from having a thin stratum of water near the generating surface. In such a case, it seems clear, that the generating particles at the bottom of this narrow chamber, would be quite as much pressed by the pressure of the fluid, as though the boiler was occupied by a body of water up to its diameter. The water surface should be as large as the actual fire surface, but in such an arrangement it would be but about one-tenth as large. There could not be a good circulation, and the generation would interfere with its own progress. The principle above described might be employed with advantage in stationary, as well as in steam-boat boilers, and in them the arrangement shown in fig. 1, would become more practicable.

I proceed to a second suggestion of what appears to me to be a durable and efficient apparatus, for lessening the danger of explosion in steam boilers. The inventor freely gives it for the benefit of the mechanical public; holding the opinion that any contrivance which has for its object the prevention of human suffering, death, and sacrifice of property, as a safety

* As would be shown by the branches of the supply pipe in fig. 2, inverted.

apparatus has, should present too strong a claim to the humanity of an inventor, to permit him to retard its general application, by any pecuniary considerations, or exclusive privileges.

The method about to be described, proposes to supply the boiler with water, during the occasional stoppages of the steam engine, to which times, and to its attending circumstances, the explosion of boilers seem almost invariably to be traced. In the annexed figure, A represents a boiler, B an upright cylinder or reservoir for water; C is a tube entering the boiler just below the common water level, and making a communication between it and reservoir B; D is the induction pipe, through which the engine forces the supply of water for the boiler, into B. The action is supposed to be this: the engine having been stopped, as will frequently happen, and in some cases, regularly, the water in the boiler, evaporates below the orifice of pipe C, the regular supply forced in by the engine, being cut off by its inactivity. Then, as fluids are still governed by the laws of density and gravity, under high pressure, the steam passing through the tube C, will rise to the top of B, permitting water equal in bulk to flow into the boiler, until the orifice of C is covered. It may be necessary that B be lined with wood, that the steam imprisoned may not be too much condensed, or the water will be forced back from the boiler. At the next discharge of water, however, this would be corrected. When the engine is again put in action, the cold water entering at D, condenses the steam in B, and fills it with water. The reservoir B may be made large enough to supply the boiler for one, two or more hours.




The imperfection that presents itself in considering this plan, is this: in case the water becomes all discharged from B, and the engine not set in motion at the end of a limited time, the boiler is as exposed to danger with as without the safety apparatus. To remedy this defect, the float E, and safety valve have been added. F represents the safety valve, with the lever and weight in the usual form, except that the seat or receptacle of the valve is turned with steps, so that the conical valve touches it at two or three points, all of which it has been ground to fit perfectly tight. It is conceived by this means, less liable to become disordered by the rusting of the valve or seat, or the accumulation of matters about them. From the bottom of the safety valve, a brass chain is attached, and descends through a hole made through the float E, and through a pulley, fastened to the bottom of B, and rising up again, it ends in two branches which are made fast to the float.

The float E is supposed to draw on the safety valve, with a buoyancy equal to 20 or 30 pounds, this combined with the pressure of the lever and weight, is equal to the maximum pressure maintained in the boiler. Now when the water is discharged from B, the float pressure of 20 or 30 pounds being taken off, the safety-valve rises, and continues to blow off steam until the engine is again set in motion, and B becomes filled with water. The steam which enters B will not be wasted, though condensed, the water when discharged, carrying the heat back to the boiler again.

New York, April 1, 1836. R. M.

## *Notice of Coal Mines in Illinois.* By a Correspondent.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen—I have received the following information in relation to a locality of coal in Illinois, from Mr. Hall Neilson, of Richmond, Virginia, and consider it of sufficient importance to ask you to place it on the pages of your Journal for permanent reference. The coal alluded to is a dry bituminous coal, of which specimens have been placed in the Cabinet of the Franklin Institute, and of the American Philosophical Society.

The Mount Carbon Coal Mines are on the margin of Big Muddy River, near Brownsville, Jackson County, Illinois, a short distance from its junction with the Mississippi River. The upper stratum of coal which is now opened, and has been worked on a limited scale for many years, is about six or seven feet thick, and lies in a horizontal position above high water mark, leaving room for wharfage between the river and the mines. This coal combines the qualities of the *anthracite* with *pure charcoal*, with a remarkable freedom from sulphur, slate, and other impurities; makes an open fire, ignites very easily, and burns with much flame, and a strong heat, producing little smoke, cinder, or ashes. These rare qualities render this coal of great value and importance in the manufacture of iron and steel, and particularly so, in the production of *steam*. Coal must ere long, be generally adopted for the use of steam-boats, and sugar plantations, on the Mississippi, and for foundries, steam-mills, sugar refineries, cotton presses, and other works at New Orleans; there would, besides, if this coal were in the market, be a large demand for the outward bound shipping from that port, and as ballast for those in the Havana and South American trade, indeed the demand may be considered almost unlimited.

It is understood that the present proprieter of these mines wishes that their working should be undertaken by a company, to form which he has made arrangements.

A Correspondent.

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## *Table of the Properties, &c., of the Metals, taken from a table by M. Chaudet, of the Paris Mint.* By Franklin Peale, Melter and Refiner of the U. S. Mint.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—The following table contains an abstract of the more important and interesting particulars relating to the metals. It is offered for publication under the belief that it will be useful as a matter of reference. The headings of the various columns are believed to be sufficiently explicit to guide the reader. A few of the less important, or more recently discovered, metals, are not inserted; their names are, however, given at the close of the table.

Yours, &c.

Franklin Peale.

| | Names of the metals. | Dates of Discover y. | Names of the Discoverers. | Names of the places where the principal mines are situated. |
|---|---|---|---|---|
| 1 | Antimony, | 15th cent'y. | Basil Valentine describes the process for extraction. | In France, at Altemont; in Sweden, at Alteberg; in Hungary, in the mines of Cremnitz, and Chemnitz; in Bohemia, in Saxony, in Tuscany, &c. |
| 2 | Silver, | Earliest antiquity. | | In France, at Altemont, St. Marie aux Mines; Saxony, at Freiberg; in Norway, Spain, Peru, Mexico, Siberia, &c. |
| 3 | Arsenic, | 1733 | Brandt. | In France, at St. Marie aux Mines; Saxony, at Freiberg; Bohemia, England, in the mines of Cornwall, &c. |
| 4 | Barium, | 1807 | Indicated by Davy. | In France, at Royut, (Puy de Dome;) England, "Anglesarcke;" Saxony, near Freiberg; Siberia, Schlangenberg, &c. |
| 5 | Bismuth, | 1520 | Described in the treatise by Agricola. | In France, in Brittany, the Pyrenees; Bohemia, at Gonchienstat; Saxony, at Freiberg; Sweden, Transylvania, near Salatua, &c. |
| 6 | Cadmium, | 1818 | Herman, or Stromeyer. | In Hungary, in the "Bleude Rayonne" of Gazibram. |
| 7 | Calcium, | 1807 | Indicated by Davy. | In France, at Montmartre near Paris, Vizelle near Grenoble; England, in the county of Cumberland; Scotland; Spain, in the province of Estremadura. |
| 8 | Cerium, | 1804 | Hysinger and Berzelius. | In Sweden at Reddarhyta, in the mines of copper of Bastnais; Greenland, &c. |
| 9 | Chromium, | 1797 | Vauquelin. | In Peru, United States, Siberia, &c. |
| 10 | Cobalt, | 1733 | Brandt. | In France, in the Pyrenees, at Altemont; Sweden, at Tauxberg; Saxony, at Amaberg; Bohemia, at Joachienstat; Hesse; Spain, in the valley of Gistan, &c. |
| 11 | Columbium or Tantalum, | 1802 | Hatchet. | In Sweden, America. |
| 12 | Copper, | Antiquity. | | In France, at St. Bel, near Lyons, Chessy; Spain, Piedmont, England, Germany, Hungary, Sweden, Siberia, North and South America, &c. |
| 13 | Tin, | Antiquity. | | In Spain, near Montery; England, co. of Cornwall; Bohemia, Saxony, East Indies, Banca, Malacca, &c. |
| 14 | Iron, | Antiquity. | | In France, at the foot of the Pyrenees; Formoot in Vosge, Normandy, Burgundy; in Germany, Elba, Italy, Siberia, America, &c. |

| | Names of the substances with which the ore is united in the mines. | State in which they are found | Principal processes of reduction. |
|---|---|---|---|
| 1 | Sulphur and oxygen. | Native and mineralized. | After purifying the sulphuret, it is roasted with charcoal, "sel du soude," soda, and melted. |
| 2 | Antimony, arsenic, sulphur, mercury, oxygen, chlorine. | Native and mineralized. | The sulphuret is roasted with salt, heated with mercury and iron, and the amalgam distilled. |
| 3 | Oxygen, sulphur, several metals in the state of arseniates. | Mineralized. | By the calcination of the minerals which contain arsenic, this metal sublimes. |
| 4 | Oxygen, sulphuric and carbonic acids. | Mineralized. | By means of the voltaic pile, but obtained in very small quantity. |
| 5 | Oxygen, sulphur, and arsenic. | Mineralized. | Mineral bismuth is simply melted, and kept hot some time, to drive away the arsenic. |
| 6 | Oxide of zinc. | Mineralized. | The mineral zinc extracted by sulphuric acid, the Cadmium alone is precipitated by hydrochloric acid. |
| 7 | Sulphuric, carbonic, fluoric, and phosphoric acids. | Mineralized. | By means of the voltaic pile, but obtained only in very small quantities. |
| 8 | Oxygen, silica, and oxide of iron. | Mineralized. | The oxide is mixed with soot and oil, and melted in a strong fire. |
| 9 | Oxygen, oxygen and lead, forming the chromate of lead. Oxygen and oxide of iron. | Mineralized. | The oxide is mixed with soot and oil, and melted in a strong fire. |
| 10 | Oxygen, arsenic, iron, sulphur, nickel, sulphuric and arsenic acids. | Mineralized. | The oxide is mixed with soot and oil, and melted in a strong fire. |
| 11 | Oxygen forming the Colombic acid, oxides of iron, manganese, and itrium. | Mineralized. | By treating the Colombic acid as oxide of Cobalt is treated. |
| 12 | Oxygen, sulphur, carbonic, hydrochloric, and sulphuric acids. | Native and mineralized. | The sulphuret is roasted several times, then refined in a reverberatory furnace, the bottom of which is covered with a mixture of charcoal and clay. |
| 13 | Oxygen, sulphur. | Mineralized. | The oxide is pounded, washed, roasted, and treated afterwards in a furnace with powdered charcoal. |
| 14 | Oxygen, sulphur, carbon, carbonic, hydrochloric, and sulphuric acids. | Native and mineralized. | The oxide is pounded, washed, sometimes roasted, and melted in a high furnace, with fluxes of argil and lime; the cast-iron is afterwards converted into wrought iron. |

| | Names of the metals. | Colour. | Character. | Specific Gravity. | Degree of fusibility. | Action of heat and air. |
|---|---|---|---|---|---|---|
| 1 | Antimony, | Blueish white. | Brittle. | 6.7021 | 431° Cent. therm. | Oxidable and volatile. |
| 2 | Silver, | Shining white. | Ductile. | 10.4753 | 23° Wed.'s Pyrometer. | Not oxidable. |
| 3 | Arsenic, | Grayish white. | Brittle. | 5.9590 | Undetermin'd. | Acidifiable & volatile. |
| 4 | Barium, | Undetermined. | Undeter'd. | Undeter'd. | Undetermin'd | Oxidable in the open air. |
| 5 | Bismuth, | Grayish white. | Brittle. | 9.8220 | 256° Cent. therm. | Oxidable. |
| 6 | Cadmium, | Silvery white, approaching blueish. | Ductile. | 8.6040 | A little more fusible than zinc. | Oxidable and very volatile. |
| 7 | Calcium, | Undetermined. | Pulverulent | Undeter'd. | Undetermin'd | Oxidable in the open air. |
| 8 | Cerium, | Grayish white. | Brittle. | Undeter'd. | Infusible at the heat of the furnace. | Oxidable. |
| 9 | Chromium, | Grayish white. | Brittle. | Undeter'd. | Almost infusible at the heat of the forge. | Oxidable. |
| 10 | Cobalt, | Grayish white of tin. | Brittle. | 8.5384 | 130° Wedg'ds Pyrometer. | Oxidable. |
| 11 | Columbium, or Tantalium, | Deep gray. | Pulverulent | Undeter'd. | Infusible at the heat of the forge. | Acidifiable. |
| 12 | Copper, | Redish yellow. | Ductile. | 8.8950<br>8.6670 | 27° Wed's pyrometer. | Oxidable. |
| 13 | Tin, | White approaching that of silver. | Ductile. | 7.2910 | 210° Centig'e therm. | Oxidable. |
| 14 | Iron, | Gray, with a blueish tint. | Ductile. | 7.7880 | 158° Wed's pyrom. | Oxidable. |

| | Action of acid with heat. | | |
|---|---|---|---|
| | Nitric of 40° Baumé. | Sulphuric of 66°. | Hydrochloric of 22°. |
| 1 | Very strong, converted into a white, insoluble oxide. | Feeble. | Very feeble. |
| 2 | Strong, solution complete. | Strong, and the solution complete. | No action. |
| 3 | Strong, converted into soluble arsenic acid. | Feeble. | Feeble. |
| 4 | Violent, solution complete. | Violent, converted into an insoluble sulphate | Violent, solution complete. |
| 5 | Strong, solution complete. | Feeble, forming a small quantity of white insoluble oxide. | Very feeble. |
| 6 | Strong, solution complete. | Complete solution. | Lively, solution complete. |
| 7 | Violent, solution complete. | Violent, converted into a sulphate almost insoluble. | Violent, solution complete. |
| 8 | Scarcely perceptible. | No action. | No action. |
| 9 | Scarcely perceptible. | Feeble. | No action. |
| 10 | Strong, complete solution. | Feeble. | Feeble. |
| 11 | Scarcely perceptible. | No action. | No action. |
| 12 | Strong, solution complete. | Strong, but the anhydrous sulphate is soluble in water. | Fusible, forming the hydrochlorate, soluble. |
| 13 | Very strong, converted into white insoluble oxide. | Feeble. | Very strong, solution complete. |
| 14 | Very strong, solution nearly complete, and forming an insoluble oxide. | Feeble; but with weak acid, solution complete. | Very strong, solution complete. |

| | Names of the metals. | Dates of discovery. | Names of the Discoverers. | Names of the places where the principal mines are situated. |
|---|---|---|---|---|
| 15 | Iridium, | 1803 | Descotels. | Always mixed in the mines with platinum. |
| 16 | Lithium, | 1818 | Arfwedson. | In Sweden, in the Petalite of the mine of Uto. |
| 17 | Manganese, | 1774 | Gahn & Scheele | In France, at Aveline, (Vosges,) in the Perigueax, and the Romanesche; Saxony, Bohemia, Piedmont, Germany. |
| 18 | Mercury, | Antiquity. | | In France, in Dauphiny; Spain, at Almaden; Germany, at Idria; Italy; Hungary, near Chemnitz; in America, in Peru, &c. |
| 19 | Molybdenum, | 1782 | Suspected by Scheele, proved by Hielm; also suspected by Bergman. | In France, in the Vosges, at the mine of Tillot, environs of Mont Blanc; Bohemia, in the mines of tin at Schlanckenwald; Saxony, Sweden, Iceland, &c. |
| 20 | Nickel, | 1751 | Cronstedt. | In France, in Allemont; Saxony, at Scheneberg, Armaberg, Freiberg; Bohemia, Joachinstat. |
| 21 | Gold, | Antiquity. | | In France, in the valley of Doysan; the sands of several rivers on the continent, the Rhone, Garonne, &c.; in Spain, Germany, Hungary, America, North and South, &c. |
| 22 | Osmium, | 1803 | Tennant. | Always mixed with mineral platinum. |
| 23 | Palladium, | 1803 | Wollaston. | Always mixed with the mineral platinum. |
| 24 | Platinum, | 1741 | Wood, Assayer in Jamaica. | At Choco, at Barbacons, St. Domingo; in the bed of the river Yaki, South America, Spain, Russia. |
| 25 | L  d, | Antiquity. | | In France, in Vienne, (Isere,) Poulhavuen, St. Sauveur, Languedoc, &c.; Germany, in Carinthia; Siberia, at Tarnowitz; in Spain; England, in Derbyshire, &c. |
| 26 | Potassium, | 1807 | Davy. | Wherever there exists lignious plants, particularly at Dantzic, in the Vosges, America, Russia. |
| 27 | Rhodium, | 1803 | Wollaston. | Always mixed with mineral platinum. |
| 28 | Sodium, | 1807 | Davy. | In France, Spain, in the plants which grow on the borders of the Mediterranean; Egypt; Hungary. |
| 29 | Strontium, | 1807 | Indicated by Davy. | In France, near Paris, at Menilmontat, Montmatre, Beauvior, (Mance;) Pennsylvania; Scotland, at Strontian; Peru, near Popayan, &c. |

| | Names of the substances with which the ore is united in the mines. | State in which they are found | Principal processes of reduction. |
|---|---|---|---|
| 15 | Osmium, mineral platinum. | Mineralized. | By the humid process. |
| 16 | Oxygen, and mixed with petalite and tourmaline. | Mineralized. | By means of the voltaic pile, but in very small quantities. |
| 17 | Oxygen, sulphuric, and phosphoric acids. | Mineralized. | The oxide is mixed with soot and oil, and melted in a strong fire. |
| 18 | Sulphur, silver, hydrochloric acid. | Native and mineralized. | The sulphuret is mixed with lime, and heated in iron vessels; the mercury is volatilized. |
| 19 | Sulphur, oxygen, and lead, forming the molybdate of lead. | Mineralized. | By treating the Molybdic acid as the oxide of Cobalt is treated. |
| 20 | Oxygen, arsenic, iron, cobalt, sulphur. | Mineralized. | The oxide is mixed with soot and oil, and melted in a strong fire. |
| 21 | Silver, copper, sulphurets of iron and copper. | Native. | Sometimes roasted, and treated with mercury, and distilled. |
| 22 | Iridium, mineral platinum. | Mineralized. | By the humid process. |
| 23 | Mineral platinum. | Mineralized. | By the humid process. |
| 24 | Palladium, rhodium, osmium, iridium. | Mineralized. | It is treated by nitro-muriatic acid, and precipitated by muriate of ammonia, and the precipitate calcined. |
| 25 | Oxygen, sulphur, sulphuric, carbonic, phosphoric, hydrochloric, chromic, molybdic, and arsenical acids. | Mineralized. | The sulphuret is pounded, washed, roasted, and melted in a furnace with charcoal. |
| 26 | Oxygen, sulphuric, hydrochloric, carbonic, and nitric acids. | Mineralized. | By treating the hydrate of potash at a high temperature with iron. |
| 27 | Mineral platinum. | Mineralized. | By the humid process. |
| 28 | Oxygen, sulphuric, hydrochloric, and carbonic acids. | Mineralized. | By treating the hydrate of soda, at a high temperature, with iron. |
| 29 | Oxygen and acid, in the state of sulphate and carbonate. | Mineralized. | By means of the voltaic pile, but in very small quantity. |

| | Names of the metals. | Colour. | Character. | Specific Gravity. | Degree of fusibility. | Action of heat and air. |
|---|---|---|---|---|---|---|
| 15 | Iridium, | Silverish white. | Undeter'd. | 18.6800 at least. | Infusible in the heat of the forge. | Not oxidable. |
| 16 | Lithium, | Undetermined. | Undeter'd. | Undeter'd. | Undetermin'd | Oxidable in the open air. |
| 17 | Manganese, | Grayish white. | Brittle. | 6.8500 | 160° Wed'd. pyrom. | Very oxidable |
| 18 | Mercury, | White, appr'ing to silver. | Fluid. | 13.5680 | –39° Cent. th. | Oxidable and volatile. |
| 19 | Molybdenum, | Deep gray. | Brittle. | 7.4000 | Scarcely fusible. | Acidifiable & volatile. |
| 20 | Nickel, | Deep gray. | Brittle. | 8.2790 | 160° Wed'd P | Scarcely oxidable. |
| 21 | Gold, | Pure yellow. | Ductile. | 19.3610 19.2580 See note at end.† | 32° Wed'd pyrom. | Not oxidable. |
| 22 | Osmium, | Powder black or blueish. | Pulverulent | Undeter'd. | Infusible in the heat of the forge. | Oxidable and volatile. |
| 23 | Palladium, | White, appr'ing to silver. | Ductile. | 12.0020 11.6270 | A little less fusible than iron. | Not oxidable. |
| 24 | Platinum, | White, appr'ing to silver. | Ductile. | 22.6690 20.9800 | Infusible in the heat of forge. | Not oxidable. |
| 25 | Lead, | Gray white, approaching blue | Ductile. | 11.3520 | 260° Cent. th. | Oxidable and vitrifiable. |
| 26 | Potassium, | Grayish white. | Ductile. | 0.86507 | 58° Cent. th. | Oxidable in the open air. |
| 27 | Rhodium, | Grayish white. | Brittle. | appears to be 11.0000 | Infusible in the heat of the forge. | Not oxidable. |
| 28 | Sodium, | Grayish white. | Ductile. | 0.97223 | 90° Cent. th. | Oxidable in the open air. |
| 29 | Strontium, | Undetermined. | Undeter'd. | Undeter'd. | Undetermin'd | Very oxidable |

| | Action of acid with heat. | | |
|---|---|---|---|
| | Nitric of 40°. Baume. | Sulphuric of 60°. | Hydrochloric of 20°. |
| 15 | No action. | No action. | No action. |
| 16 | Violent, solution complete. | Violent. | Very strong. |
| 17 | Slight, solution incomplete. | Feeble, but with a weak acid, complete. | Very strong. |
| 18 | Strong, solution complete. | Feeble. | No action. |
| 19 | Forming molybdic acid, a grayish insoluble powder. | Feeble. | No action. |
| 20 | Strong, complete solution. | No action. | Feeble. |
| 21 | No action. | No action. | No action. |
| 22 | No action. | No action. | Feeble. |
| 23 | Slight, but solution complete. | Very feeble. | No action. |
| 24 | No action. | No action. | No action. |
| 25 | Strong, complete solution. | Strong, converted into the insoluble sulphate of lead. | Feeble. |
| 26 | Violent, solution complete. | Violent, forming an insoluble sulphate. | Violent, solution complete. |
| 27 | No action. | No action. | No action. |
| 28 | Violent, solution complete. | Violent, forming an insoluble sulphate. | Violent, solution complete. |
| 29 | Very strong, solution complete. | Violent, forming an insoluble sulphate. | Violent, solution complete. |

| | Names of the metals. | Dates of Discovery. | Names of the Discoverers. | Names of the places where the principal mines are found. |
|---|---|---|---|---|
| 30 | Tellurium, | 1782 | Muller. | In Transylvania, at Offenbanger, Fatzbay, in the mines of Maria Lozetto. |
| 31 | Titanium, | 1781 | Gregor. | In France, near Limoges, at Allemont. Hungary, near Boinik; Spain, at Cajuelo; America; England, in Cornwall, &c. |
| 32 | Tungsten, | 1781 | Delhugart. | In France, in the department of Isere and Haute Vienne; Bohemia, at Zinnwald; Saxony, at Ehrenfreidersdorf; Sweden, at Bilverg, &c. |
| 33 | Uranium, | 1789 | Klaproth. | In France, at Simphorien, near Autun, environs of Limoges; Bohemia, at Goachinsthat; Saxony, at Schverberg; England, in Cornwall. |
| 34 | Zinc, | 1541 | Indicated by Paracelsus. | In France, at Vizille, (Ysere,) Bagoory, (haute Pyrenees;) Sweden, at Dammera; England, counties of Somerset and Nottingham; Swabia, Poland, Hungary, &c. |

| | Names of the substances with which the ore is united in the mines. | State in which they are found | Principal processes of reduction. |
|---|---|---|---|
| 30 | Iron and gold, gold and silver, gold, silver, and sulphur, lead, sulphur, and copper. | Mineralized. | By the humid process. |
| 31 | Oxygen. | Mineralized. | By mixing the oxide with soot and oil, and melting in a strong fire. |
| 32 | Oxygen and lime, oxygen and iron, forming the "tungstates." | Mineralized. | By treating the acid of Tungsten as the oxide of Cobalt. |
| 33 | Oxygen in the state of protoxide and peroxide. | Mineralized. | By mixing its oxide with soot and oil, and melting in a strong fire. |
| 34 | Oxygen, cadmium, sulphur, carbonic and sulphuric acids. | Mineralized. | By treating the Calamium in closed vessels, with charcoal, the zinc sublimes, and is afterwards melted. |

* There are six others metals, whose existence was first admitted by analogy, or because the matters from which they are extracted have the greatest resemblance to metallic oxides, viz: Magnesium, Glucinium, Lithium, Aluminium, Thorium, and Zirconium. The existence of these metals has been proved, and others discovered, since this table was prepared.

| | Names of the metals. | Colour. | Character. | Specific Gravity. | Degree of fusibility. | Action of heat and air. |
|---|---|---|---|---|---|---|
| 30 | Tellurium, | White, appr'ing to silver. | Brittle. | 6.1150 | A little less fusible than lead. | Very oxidable |
| 31 | Titanium, | Redish brown. | Brittle. | 5.3000 | Infusible in the heat of the forge. | Oxidable. |
| 32 | Tungsten, | Blueish gray. | Brittle. | 17.6000<br>17.5000 | Almost infusible. | Oxidable. |
| 33 | Uranium, | Deep gray. | Brittle. | 9.000 | Almost infusible. | Oxidable. |
| 34 | Zinc, | Grayish white, approaching to blue. | Ductile. | 7.1000<br>6.8610 | 370° Cent. th. | Oxidable and volatile. |

| | Action of acid with heat. | | |
|---|---|---|---|
| | Nitric of 40°. Baume. | Hydrochloric of 20°. | Sulphuric of 60°. |
| 30 | Strong, solution complete. | Feeble. | No action. |
| 31 | Scarcely perceptible. | No action. | Feeble. |
| 32 | Scarcely perceptible. | No action. | No action. |
| 33 | Strong solution complete. | No action. | No action. |
| 34 | Strong solution complete. | Feeble; but with weak acid, the solution complete. | Very strong, solution complete. |

† Whenever two specific gravities are expressed, the first is that of the metal hammered or condensed, by rolling. Several other metals have been discovered since the date of this table, and several of the compartments marked undetermined, will be found in the last edition of Thenard.

## Physical Science.

*Second Report of the Joint Committee on Meteorology, of the American Philosophical Society and Franklin Institute.*

In commencing this report we have still to regret that the extent of our correspondence north-west and south-east is not great enough to enable us to ascertain the boundaries of our great storms in those directions; and of course we cannot determine the direction of the winds in those boundaries —a knowledge which we believe to be of the highest importance to the science of meteorology. The committee do not yet despair, however, of extending this correspondence so far as to attain so desirable an end, and with the hope of aiding this extension, proceed to give an account of a few of the most remarkable storms which have occured since their first report.

These we are sure will be found to be highly interesting, even with the imperfect knowledge which our limited correspondence enables us to give of them. It will be seen that the character of some of them varies from our great north-east storms which come from the south-west. They seem to have travelled southwardly or south-eastwardly, as will be seen by the storms of the 14th and 15th of May, of the 20th of May and 19th of June.

It is much to be hoped that gentlemen throughout the country, who may see this report, will communicate to us any fact connected with the storms here detailed, which may either be favourable or adverse to the generalization upon which we have ventured.

It would be particularly desirable to know the boundaries of the great rain which took place on the 19th of June, to the north-east. For this purpose, if gentlemen living in Vermont and New Hampshire, and the north of New York, would consult their meteorological journals, and let us know whether it rained there at that time or not, and which way the wind blew, they would confer a great favour on the committee. From the nature of the remarks below, it will be understood what kind of information is wanted. We hope every gentlemen to whom this is sent will be induced to furnish a faithful correspondent, who will at least carefully observe all storms, their beginning and ending, and the course and changes of the wind, during their progress. The labour, though great, of collating numerous journals, and deducing from them general conclusions, will be cheerfully continued by the committee. These journals are carefully preserved in the archives of the Franklin Institute, and will be accessible to any meteorologist who may wish to consult them.

We now proceed to detail the phenomena attending the most remarkable rains and storms which took place between the date of our first report and the eleventh of November, 1835; and to enable the reader to comprehend the report with greater ease, we recommend him to bear in mind this remarkable generalization—*In all the seven storms examined, the wind blew towards the point where it was raining.* To this rule there is not one exception; for though the very first storm mentioned, that of the 26th of April, terminated at Philadelphia, and passed on to the north-east, with the wind still from the north-east, it appears plainly that a much greater storm was raging at that very time at no great distance to the south-west, in the very direction towards which the wind was blowing.

The storm of the 20th of May was evidently too local in its character to form an exception. As it is known, however, that many of our summer

storms set in with the wind near the surface of the ground, blowing from the centre of the storm, it becomes a question of high importance to investigate the cause of this difference.

*Storm of 26th and 27th of April*, 1835.—On the night of the 25th and morning of the 26th of April, at *Philadelphia*, there was a great rain, with the wind at north-east. At the end of the rain the wind continued from the north east with abated violence, being almost calm on the morning of the 27th, with the lower clouds from the west-north-west, and the upper clouds from the west. At three P. M. the wind was from the east, pretty fresh. At six P. M. a very great rain commenced, which continued through the night, the wind changing round by the north, and at ten the next morning it still rained very hard, with the wind from the north-west, and violent. The rain began to abate at seven, the wind being still violent from the west-north-west, and at eight the rain ceased, with the wind west-north-west, its violence having a little abated. The barometer was now rising rapidly.

At *Cape May*, on the night of the 27th, the wind was violent from the south.

At *Baltimore*,* the rain was very great on the night of the 25th, and continued the most of the day of the 26th. The wind was north-east all day on the 27th. The rain began at three P. M. became very heavy at four, and continued so through the night. On the morning of the 28th, the wind was north-west, and scud and heavy cumuli were rolling off to the south-east. The wind was west in the afternoon.

At *Flushing*, Long Island, New York,† after the rain of April 25th and 26th, the wind continued north-east till half past two o'clock, P. M. of the 27th, when it was south-west. At six it was south, and at seven P. M. it changed suddenly to south-east. The rain commenced at nine P. M. and continued till half past twelve P. M. of the 28th. The wind was very high. In the morning was north-east, and at noon north-west, continuing so all day.

At *Middletown*,‡ Connecticut, after the rain of the 25th and 26th, the wind was variable till some time on the night of the 27th, when the rain commenced, and continued violent. The wind was easterly till eleven, A. M. when it changed to south-east, at noon to south, and at two P. M. to west, the rain continuing with unabated violence all the forenoon. From five P. M. of the 26th till noon of the 27th, the barometer fell more than an inch. The wind westerly in the afternoon.

At *Brown University*,§ Providence, Rhode Island. After the rain of the 25th and 26th, the wind hauled round by the north to north-west, and cleared on the evening of the 26th. On the 27th, the wind came round to the east in the afternoon, and the evening was cloudy. On the 28th, from three to four A. M. there was a heavy blow from the east, with copious rain; at ten A. M. the rain ceased, the clouds beginning to be broken, and the wind violent, hauling southerly. At one P. M. the wind was south-west, very heavy; at four P. M. the wind was westerly, its violence had abated, and the clouds were broken. The barometer began to rise. The weather cleared from nine to ten P. M. the wind having abated; on the next day the wind was westerly.

*Our correspondent is Dr. G. Sproston, U. S. Navy.
†Our correspondent at Flushing is Mr. C. Gill.
‡Our correspondent is Mr. A. W. Smith.
§Our correspondent is Professor Caswell.

*Storm of 4th and 5th of April*, 1835.—*Brown University.* On the 3d of April, 1835, there was a great rain in the night, commencing between eight and nine.

On the 4th, at sun-rise, the wind was north-east, but during the morning it hauled to the north and north-west; towards night swung back to the north-east, and blew heavily during the night. There was a mist, but no rain.

On the 5th, at sun-rise, the wind was heavy from the north-east; there was rain occasionally during the day. From seven to eight o'clock, P. M. the wind came round to the south-west. The clouds had broken away at nine, and the sky was clear at ten.

6th, light shower at nine P. M. wind south-west.

*Baltimore*,* Maryland. On the 3d, the wind was east, south-east and east. There was a light sprinkling of rain from two to four P. M. The sky was overcast in the evening.

On the 4th, the wind was east in the morning, south-east in the afternoon, with a sprinkling of rain at fifty minutes past ten, A. M. to twelve. The rain recommenced at nine P. M. with lightning, and continued with high wind through the night, turning to sleety snow at twenty-five minutes past nine, A. M. of the 5th, and terminating at fifty minutes past ten, A. M. with the wind east. At twelve the wind changed round to the west, with a heavy reflux of cumuli from the east. At sun-set the wind was south-west, with some rain; starlight at ten P. M.

*Philadelphia.* On the 3d and 4th, the wind and lower clouds were from the north-east, the upper clouds from the south-west, and middle clouds from south-west, with very hard rain, commencing some time in the night of the 4th, with thunder and hail; continuing on the 5th very hard, with wind east-north-east, violent till half past ten, A. M. The wind changing to east at eleven, blew less violently, and was south-south-east at one P. M. nearly calm; the lower clouds south. The wind was south at half past three P. M. strong from west-south-west at six P. M. strong on the 6th, the wind moderating a little. The rain ceased at noon; very little in the afternoon.

At *Flushing*, Long Island, New York. On the 4th, the wind rose at half past ten P. M. north-east, having been gentle in that direction for two days. It was very high the next morning in the same direction, at a quarter past seven; at quarter past twelve was very high from the east; at half past three brisk from the south-east, and at six high from the south-west. Rain commenced with thunder, at half past eleven, A. M. and with some intermission, ended at two P. M.

At *Baltimore.* On the 4th of May, at half past three P. M. a nimbus rose from the west, against a strong south-east wind; it burst at four, with thunder and lightning, and rained nine-tenths of an inch.

*Storm of May 15th*, 1835.—*Norfolk*,† Virginia. On the morning of the 15th, there was a great rain, ending at twelve o'clock. At *Philadelphia*, all that morning there was a strong wind and lower clouds from north, and upper clouds from south-south-west, continuing till four P. M. when the clouds disappeared. During the same morning, at *Brown University*, the wind was north-east; with misty rain till twelve.

At *Flushing*, the same morning, the wind was high from the north-east,

*Our correspondent is Dr. G. S. Sproston, U. S. Navy.

† From the newspapers.

the lower clouds from the north-east, the middle from the north, and the upper from the west, and at *Cincinnati*,* Ohio, south-west.

This rain seemed to have travelled south, for it ceased to rain at Philadelphia on the 14th, at half past twelve; with the wind changing from north-east to north, it continued to rain hard at Baltimore, at three P. M. and only ceased at four. Or as it rained a little on the 15th, at Brown University, till twelve, did it spread outwards in all directions from some centre?

At Portsmouth, sharp lightning south-east, at half past eight P. M.

*Storm of the 20th of May.*—This last appears to be the character of a rain which occurred on the 20th of May, at *Silver Lake*,† Pennsylvania. On this day, at one P. M. a violent thunder storm commenced, with hail, from the west, the day having been clear till that time.

At *Farmington*, Connecticut,‡ a violent storm commenced at four P. M. and lasted till nine.

At *Flushing*, a violent thunder storm began at five, and lasted half an hour, preceded by a squall of wind from the west, the wind having been all day west.

At *Brown University*, a light shower, with thunder and lightning, from six to eight P. M. wind south westerly all day.

At *Philadelphia*, about seven P. M. a strong wind commenced suddenly from the north-west, it having been pretty strong from the south-south-west all day; at the same time when the wind began to blow from the north-west, the lower clouds were coming from the south-west, and the middle clouds from the north-west; at eight o'clock it began to rain, barometer rising .05 of an inch in an hour. There was some thunder, but not much rain till some time in the night.

At *Baltimore*, it was clear on the 20th at ten P. M. and did not begin to rain till late in the night, and it continued showering the next day till a quarter past nine, P. M.

*Storm of July 15th*, 1835.—At twelve o'clock a violent rain, with hail, commenced at *Baltimore*, with the wind north-east, continuing till seven P. M. The course of the wind in the afternoon not given, but on next day it was west; on the same afternoon and evening there fell tremendous floods at *Woodbury*, New Jersey. At five P. M. when it was raining hard in New Jersey, the wind changed to north at *Philadelphia*, with very dense black clouds coming rapidly from the south, and at six o'clock a most violent rain commenced, lasting till about eleven P. M. with the wind from the north. During all this time there was a most violent gale at *New York*, from the north-east; the rain commencing there at nine P. M. while at *Washington City*, the wind continued all that day and the next, from the south-west, with rain on the 15th, at what hour not mentioned. At *Lancaster*, Pennsylvania, the wind was north, with rain, which is not stated, to have been remarkable. From the phenomena here recorded, it appears that the wind below at New York, Philadelphia and Washington City, was blowing towards a point in New Jersey, for several hours, at the same time when it was raining there most violently. The same was the case at Philadelphia, at least the clouds were coming thick and dark above, from the same point, while the wind below was going to that point.

*From the newspapers.

†Our correspondent is Dr. R. H. Rose.

‡Our correspondent is Mr. James Porter Hart.

*Storm of November 11th*, 1835.—The particulars of this remarkable storm will be given hereafter in the Journal of the Franklin Institute; at present we will only say that at *Oswego*, in the south-east corner of Lake Ontario; at the *Ducks*, in the north-east corner; at *Buffalo*, and various other parts in the south-western part of that Lake, the wind, when it was most violent, blew for several hours towards a point in the Lake, near the eastern end, on the morning of the 11th of November, and it changed round by the south, on south side of the Lake, and by north, on north side, to westward.

The north-west corner of this Lake has not yet been heard from. Perhaps some gentleman in *Toronto*, or some place on the north side of the Lake, will have the goodness, on seeing this report, to send us the desired information.

*Tornado of June 19th*, 1835.—On the 19th of June, it rained all day at *Oxford* and *New York*, with the wind south in the morning, south-west in the afternoon.

North of *Albany* there was a very great rain, beginning about eleven, A. M. as we have been informed by Mr. Guynne, who was travelling there that day, and at *Albany* it rained 2.45 inches in the afternoon and evening; wind south in the morning, north in the afternoon.

*Brown University.* June 19th was clear in the morning, with the wind light from the south-west. The wind freshened towards night; the air very damp, with heavy fog clouds from southerly. Began to rain from eight to nine P. M. with wind very brisk from south-west. Rain 0.4 inches.

*Middletown*, Connecticut. June 19th, wind south all day; very strong in the evening; rain at noon, and a thunder shower commenced at six P. M. The barometer was lowest on the morning of the 20th; a gale all the next day from the north-west.

*Portsmouth*, N. H. June 19th, wind south at seven A. M. south-east at two P. M. and east-south-east at sunset On the 20th, gale from half past eight A. M. till half past seven P. M. west by north, with rain from seven P. M. till three A. M. of the 21st; at seven A. M. of the 20th, lower clouds west by south, upper west-north-west; barometer lowest on the morning of the 20th.

At *Mr. Bloomfield's*, 4 miles east from Piscataway, New Jersey. June 19th, about ten P. M. the wind began to blow hard from the south-west, and increased in violence till about two A. M. of the 20th, when it began to abate, and about dawn was nearly calm; during all this time very black clouds, accompanied with terrific lightning, without thunder, almost incessant, were coming exactly against the lower wind from the north-east, or perhaps a little north of that point, with clouds occasionally meeting them, moving with the wind, and the interval between the very black clouds was so bright and silvery, that the stars could hardly be distinguished. About sunrise the north-east wind began to blow, and by eight A. M. had increased to a gale, perfectly clear; continuing violent till about twelve M. when it began to abate, and at two P. M. it had died away. Next day it was strong from the south-west.

19th. On this same day, about five P. M. a violent land-spout took place at New Brunswick and its vicinity. It appeared in form of an inverted cone of smoke, reaching the ground with its apex, and its base among the clouds; it lasted only a few moments in a place, and progressed easterly, a little north, with a slow motion, not more than twenty or thirty miles an hour; it was about two or three hundred yards wide, and within that breadth left neither trees nor houses standing; all the trees were thrown inwards, and generally forwards; many of the houses had their walls prostrated

outwards, and the shingles were thrown down in great numbers in Staten Island, along with a shower of hail and rain, from fifteen to twenty-five miles north-east from where they were taken up. During the fall of the hail, on the north side of the vein, the wind was strong from the south, and on the south side of the vein, the wind chopped suddenly round to the north, the wind having been south-west before. At the distance of a few hundred yards from the spout at its passage, the wind was not remarkably strong.

In conclusion, we recommend to our correspondents to observe and note every phenomenon which may tend to establish or refute the generalization to which we turned their attention at the commencement of this report. It is a remarkable fact, and altogether consistent with the generalization here spoken of, that all our great storms which set in from some eastern point, terminate with the wind from some western point; and our correspondents will recollect that all the phenomena detailed in our first report lead to the same conclusion. Among the storms there detailed, not the least remarkable was that on the 22d of March, 1835, in which there was a perfect calm at Philadelphia for several hours, with an extremely low barometer, the sky was very cloudy, without rain, while at the same time there was a most violent rain all round Philadelphia, with very strong wind towards Philadelphia.

Was the air at this moment rising over Philadelphia so rapidly as to carry up the drops of rain and throw them off at the sides of the ascending column? Both the rapid afflux of air towards Philadelphia, at that time, and the extreme depression of the barometer there, lead strongly to an affirmative answer. How extremely interesting would it be if our correspondence were wide enough to trace these storms to their commencement, and follow them to their termination.

And if our present attempt should fail to stimulate men of science to engage in the undertaking of investigating the dynamical laws to which the movements of the atmosphere are subject, and this can only be done by simultaneous observations over a wide extent of territory, then this committee, *unless aided by Government*, will have to leave the work unfinished, and reluctantly close their labours, with perhaps one more report.

James P. Espy, Chairman Joint Committee.

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|---|---|---|---|
| Charles N. Bancker, | Com. | James P. Espy, | Com. |
| Gouverneur Emerson, | Amer. | Alex. D. Bache, | Frank. |
| Alexander D. Bache, | Phil. Soc. | Henry D. Rogers, | Inst. |
| | | S. C. Walker, | |
| | | P. B. Goddard, | |

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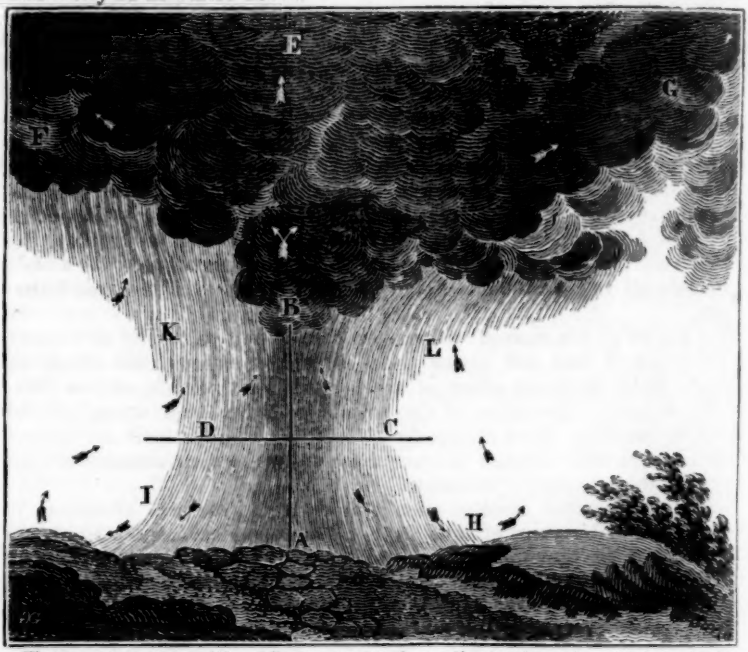
*Remarks on the foregoing Report, by the Chairman of the Committee.*

The sudden change of the wind to the north-west, on the 20th of May, at Philadelphia, in the evening, about three hours after a violent hail storm and rain in the north-west, at Silver Lake, Pennsylvania, may be accounted for by the cooling effects of these depositions on the lower stratum of air, between the cloud and the earth.

If we suppose A, B, in the accompanying wood-cut, the distance of the lower part of a cloud, producing a violent rain, to be one thousand yards, and this whole stratum to be cooled down ten degrees of Fahr., which is a moderate allowance both as to height and temperature, the density would be increased about $\frac{1}{30}$th, and of course it would overbalance, by its superior weight, the columns of air on the outside of the rain, at I and H, and move outwards from the centre of the storm, at the surface of the earth, with a

velocity due to a head of pressure of $\frac{3000}{50}$ feet, or $\surd 8 \times \frac{3000}{50} = 62$ feet per second. Whenever a hard shower takes place from a lofty cloud of moderate diameter, such will be the effect at the surface of the earth. For as the perpendicular diameter of a cloud, which produces a very hard rain, must be great, the drops of rain must descend from a great height, and will enter this lower stratum of air very cold, sometimes frozen; the effect will manifestly be as stated above.




This explanation will apply most satisfactorily to the gale which took place at Portsmouth and Middletown, from north-west, and in New Jersey, near Amboy, from the north-east, on the morning of the 20th of June, after a most violent rain, which fell on the evening and night previous, in the eastern part of New York, all round Albany. The wind in all these places blew outwards from where the rain had fallen.

The air in New Jersey was described as piercingly cold, and at Portsmouth, New Hampshire, it was fourteen degrees colder than on the day before at the same hour.

The reader will observe that the clouds below at Philadelphia continued to move from the south-west, on the 20th of May, after the wind changed round to the north-west, while at the same time an upper stratum of clouds was coming from the north-west.

The whole phenomena of this storm, and others of moderate diameter, where the cloud does not descend very low, as it did on the 19th of June, will be clearly comprehended by supposing that there is an inward motion of the air at the lower part of the cloud, an upward motion in the cloud, and an outward motion in the upper part of the cloud, as indicated by the arrows in the wood-cut.

This upward motion also, if it could be shown how it is effected, would account for the condensation of the vapour into rain by the diminution of

temperature resulting from diminished pressure, which it is known amounts to at least one degree Fahr., in the case of dry air, for every hundred yards of ascent.

The wood-cut is intended to represent only those storms of moderate size in which the cloud is of sufficient height to let the air below become so cooled as to produce an outward motion at the surface of the earth. There are, however, two other cases in nature, in which the wind at the surface of the earth blows inwards. First, when the cloud reaches down to the surface, or near the surface of the earth, as in the Brunswick spout. Second, when the cloud is of very wide extent, and the rain general; in which case the air to supply the storm with vapour or steam, cannot find room to enter under the cloud without carrying in with it all the air between the cloud and the surface of the earth.

These three kinds embrace all the varieties of storms in nature. Now as the characters of these three kinds of storms are very distinct, and as it will be very convenient hereafter to speak of them separately, I propose to call that kind which is very narrow, and having the wind blowing inwards at the surface of the earth, primary; that one which is of mean size, and has the wind blowing outwards at the surface of the earth, secondary; and that which is very wide, and has the wind blowing inwards at the surface of the earth, tertiary. The choice of these names arises from the theoretic probability that all storms commence with the first character, pass into the second, and terminate with the third.

JAMES P. ESPY.

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*Review of Mitscherlich's Compendium of Chemistry, with remarks on the method of teaching Chemistry.* By JAMES C. BOOTH.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Among the votaries of any science, a lively interest is naturally felt in the publication of works connected with that science; a feeling greatly enhanced by the circumstance of their proceeding from men of high reputation. This is more particularly the case with chemistry, which is daily increasing under the hands of its followers, by the accumulation of new and important facts, and by the proposal of new theories to account for the phenomena. Numerous works in this science, of greater or less comparative value, are yearly brought before the tribunal of public opinion, and yet there are but few which do not either wholly fail of success, or which have more than a limited circulation. The cause of this is not so much an ignorance of theory on the part of the author, as the want of sufficient practical knowledge to enable him to put much of his theory to the test. As chemistry is a science of facts, so it cannot be learned without seeing them, nor taught without being able to exhibit them; hence it is that he who has experimented himself, is better able to describe the results of his operations, than he who describes phenomena of which he has only heard or read; for the former gives the more striking impression, which the experiment made on him, the latter the impression as derived from a description. Another cause operates to render the great majority of works in this, as in other sciences, unsuccessful; they are destitute of uniformity of execution. Too few authors, in commencing a work, are themselves aware of their object, or if they be aware of it, pursue it with that uniform and steady aim which is absolutely necessary to its complete success; hence many otherwise excellent treatises are rejected for this reason alone, while others of inferior merit, but exhibiting uniformity of purpose, rise above and even supersede them. "Whoever would please every one, pleases no one," does not lose its force by repetition, for there is no single work on chemistry suited to every class

of readers or of students, nor can it indeed be anticipated in a science embracing such an infinite number of facts, and such a variety of objects. What interest does the miner, or the smelter of metals take in organic chemistry? Of how little real utility to the pharmaceutist or manufacturing chemist are discussions relative to the subtle theories of the science? Is it necessary for the purely theoretic chemist to be acquainted with all the details of the manufacturer? How little has the student, when commencing, to do with all these? Lastly, where is the chemist who can embrace them all with the same energy as when devoted to one only? Therefore I contend for unity of purpose, and uniformity of execution, and I think the answers to the foregoing questions will be found conclusive.

A work on chemistry has lately appeared to which the name of its author alone would ensure success, though not perfectly free from the faults I have above endeavoured to point out; for notwithstanding these, it possesses merits of a peculiar kind, entitling it to consideration. Whoever would call over the names of chemists of celebrity, of the present day, and omit in his catalogue that of Professor Mitscherlich, of Berlin, the founder of the doctrine of isomorphism, would do great injustice to him and to the school to which he belongs. For although this doctrine be not fully developed, it has nevertheless been resorted to with success, for correcting former errors, and strengthening certain theories, and promises to become an important agent in disclosing the hidden operations of nature. All that we have hitherto known of Mitscherlich are a few treatises, through the medium of their French translations, and we are now introduced to him as the author of a "Manual of Chemistry." I propose giving a sketch of the subjects contained in the first part of the first volume, (for the whole has not yet appeared) and would wish to draw the attention of the reader at the close, to a few remarks on an important subject, viz. the method of instruction to be pursued, in communicating the facts of chemistry to the uninitiated.

The work commences without preface or introduction, the first page containing an enumeration of the elements with which we are acquainted, and the second thus unceremoniously introducing oxygen to our notice: "If red oxide of mercury be heated in a retort, the neck of which passes through a cork in one opening of a receiver, then, through a tube fitted in another opening, bubbles of air will pass and displace the water contained in an inverted cylinder." This is accompanied by a wood cut representing the apparatus, and a detailed description of the entire operation. A few deductions are then drawn from the experiment, viz: that there is a metallic body liquid at common temperatures; that there is a gaseous body differing in its properties from common air, this being shown by transferring a part of the gas into a smaller vessel, and holding a cinder of wood in it—that these two are held together by a certain power, which is termed affinity, and similar conclusions, such as a reflecting student might be supposed to make for himself. The same experiment is then supposed to be arranged in such a manner, that the resulting metal and gas may be weighed, from which the conclusion is drawn, that the red oxide is composed of certain quantities of the two substances alone, so combined that their individual properties cannot be detected, and in this simple manner the first clear views of the effects of affinity are communicated.

The method of preparing oxygen for practical purposes, from the black oxide of manganese, is next minutely described, together with the iron retort and gas-holder employed in the operation. A large number of experiments are exhibited by Professor Mitscherlich before his class, which are

not detailed in the work, his object in doing so being the desire of keeping this first element before the student as long as possible, until the latter shall have fully made its acquaintance by a knowledge of its properties, thus proceeding upon the well established principle, that the mind lays hold of an entirely new subject by slow degrees.

The powers of combination possessed by oxygen are now mentioned, and its compounds with manganese adduced as examples of the union of one body with different proportions of another, as if to break the ground for the reception of the difficult truths relative to combining proportions, and the section is concluded by a numeral representation of the five oxides of manganese, and the three of lead.

The whole is illustrated by eleven wood cuts, representing the apparatus, with the mode of employing it.

I have dwelt more particularly on this first section, that it may serve as a specimen of the remainder, and as I wish to recur to it at the close for the elucidation of a few points, of which I intend to treat.

Hydrogen, and its combination with oxygen, are next introduced, and an experiment arranged to show the composition of water, from which the student obtains an idea of the theory of volumes, and a clearer view of the atomic constitution of bodies.

Nitrogen, and its combinations with oxygen and hydrogen, are mentioned, but not specially treated of, as the former will be found, according to the arrangement adopted by Berzelius, among the acids, the latter with the alkalies.

The peculiar properties of sulphur are now described, and as one of them, its power of crystalizing in certain forms, from which naturally flow observations on the regular forms of bodies. The solid, liquid and vapourous states are exemplified in the body before us, and the section closes with the method of obtaining and purifying it in the large way.

Selenium and phosphorus are slighty noticed, only the combinations of the latter with sulphur and hydrogen being given. Mitscherlich advances the theory that the difference between the two kinds of phosphuretted hydrogen lies merely in a small quantity of phosphorus dissolved by the self-inflammable variety, adducing as an argument the fact that hydrogen in contact with phosphorus for a length of time, takes up a small quantity, causing it to phosphoresce when exposed to the air. According to Rose's analysis, they are chemically the same, and they may be converted into each other by means which we have not as yet wholly in our power. But Mitscherlich's theory does explain how the non-inflammable is sometimes converted into the inflammable variety. It appears to me probable, that the non-inflammable phosphuretted hydrogen is a definite compound, in which the two substances are combined with such force, as not to inflame under common circumstances, but that certain causes operate to decompose it, forming another compound of hydrogen and phosphorus, by which a portion of phosphorus precipitates and is *dissolved* by the new compound, rendering it phosphorescent by the state of minute division of the phosphorus. The union of oxygen in the air with the dissolved phosphorus produces heat, and this in sufficient quantity, inflames the whole. By the reverse action, the dissolved phosphorus is again taken up into chemical union, and forms the non-inflammable variety, and I think that this is the only way in which we can explain the reconversion of one into the other, and their identity as given by analysis.

Chlorine, with its combinations with nitrogen, sulphur, and phosphorus, bromine, iodine and fluorine, follow in succession. An easy method, unat-

tended by danger, of preparing iodide of nitrogen is described, which shows the composition of this class of bodies. A small quantity of nitro-hydrochloric acid is introduced into a test-tube, and a few particles of iodine digested in it at a gentle heat. A part of the oxygen of the nitric combines with hydrogen of the hydro-chloric acid, while the liberated chlorine unites with iodine, forming a brown solution. If ammonia be added to this solution, the chlorine of the chloride of iodine unites with the hydrogen of the ammonia, while the iodide of nitrogen precipitates as a dark brown powder. It is filtered, and the paper, while wet, torn into small pieces and dried.

The diffusive nature of the remarks on phosphuretted hydrogen, while the sulphuretted is passed over in silence, is excused upon the plea, that "the latter belongs more properly to the acids." I think, however, this gas might have been exhibited to keep up in the student's mind the chain necessary to a clear comprehension of the subject.

A too strict adherence to the rule of describing "all the non-acid metalloidal compounds in this place," brings our author into difficulty, for the introduction of many of them is premature, as regards a majority of those for whom the work was intended, that is, for beginners; and accordingly, after describing cyanogen, we have a full account of the combinations of oxygen, hydrogen and carbon, followed by a description of fifteen compounds of hydrogen and carbon, and these again by the combinations of chlorine, bromine and iodine, with the preceding. The author, as if aware of having committed an error, says, "I have considered it proper to mention a large number of compounds in this place, and enough in relation to each of them to excite some degree of interest," and offering as an apology that the "reader will soon discover that a continued examination of these substances is of the highest importance, inasmuch as it may be the means of enriching the science with many interesting facts." But he does not stop here, for after very properly describing the sulphuret of carbon, we are introduced to certain compounds of oxygen, hydrogen, nitrogen and carbon, viz. to the *amids*, which close the long section on carbon. There are eighty-four pages devoted to carbon and its compounds, and only seventy-nine to all previous substances, a circumstance so out of character with the whole tenor of the work, and to the principles which originated it, that we feel ourselves led to inquire into the reason of this deviation. I offer the following very simple solution; first, that this subject, in all its bearings, is at the present moment in the hands of the most distinguished chemists, necessarily giving birth to important facts, which ought to be communicated to the scientific world as soon as possible; and second, that Mitscherlich, with his wonted ability, has himself investigated many of the above compounds, and has deviated from the principles on which the work was commenced, from a desire to make known his discoveries. That this was actually the case, I do not assert, but such are the conclusions to be drawn from a review of the Manual.

A description of borium and silicium closes the first general division of the work, viz. the metalloids and their non-acid mutual combinations.

The remainder of the first part of the first volume is occupied by, first, the general properties of air and the gases, and second, those of water, and collaterally of solid, liquid and aeriform bodies. To gain a just idea of the plan of the whole, it will be necessary to enter a little into detail. The author observes, when introducing the subject, "it appears to me to be more conducive to my end as it certainly would be more intelligible, to bring together in this place what is more general in its nature, and what has been often repeated in the foregoing, after a series of experiments have been

instituted, and many phenomena exhibited." I may however observe that the arrangement is not altogether original with Professor Mitscherlich, it being merely a modification of, perhaps an improvement on, the plan adopted by Berzelius in his large work on chemistry. While the former has neither preface nor introduction, the latter precedes his system by a somewhat cursory notice of light, heat and affinity, and a rather long article on electricity and electro-magnetism. Berzelius follows the metalloids by the general properties of gases and liquids, which subject is considerably expanded by Professor Mitscherlich, as will be seen presently.

A description of the air-pump, followed by the mode of determining the specific gravity of gases, naturally leads to an account of the pressure of the air and its measurer, the barometer. Mariotte's law of compression, and that of expansion are properly here introduced, and we are now prepared to determine the composition of the air by means of hydrogen.

The mixture of gases, and the circulation of oxygen precede an important subject, namely, the examination of substances composed of oxygen, hydrogen and carbon.

I propose hereafter to give a translation of the article on the ultimate analysis of organic substances, which, however, I must remark, I think is rather out of place, in the commencement of a work adapted to instruction.

Flame, the distillation of wood and coal, lamps and furnaces, are next minutely described, and close the general properties of air and the gases. A little reflection will, I think, show us that the greater part of the subject is much more intelligible now, than it could have been previous to the exhibition of the metalloids and their compounds, and though perhaps some of the preceding and following articles might have been omitted with propriety, yet I contend for the superiority of the plan in an elementary work, of first introducing substances, and then the laws by which they are governed in their various actions and relations.

The properties of ice, the specific gravity of solids and liquids, and their relations to heat, are succeeded by a subject on which much of the atomic theory depends, viz; the determination of the specific gravity of vapours; in order to ascertain whether the relation between the specific gravity of the solid and its atomic weight is the same as that between the vapour of that body and its atomic constitution. From the experiments of Mitscherlich and of Dumas, it would seem that from the specific gravity of the solid, we cannot draw conclusions as to that of the vapour; hence we cannot say that if a certain weight of carbon unite with a certain weight of sulphur, then so much of the vapour of carbon will unite with so much of the vapour of sulphur. But the difficulties attending such researches are too great to allow us to receive the results with implicit faith, and it is therefore advisable to await the confirming experiments of others in this most important of all subjects connected with the atomic theory.

The pressure of vapours, and by an easy transition, the theory of the steam-engine, are next treated of, and the remainder of the volume is occupied by the general relations of solids to solids, of liquids to liquids, and of these to gases, under which we find capillary attraction; solution, with an interesting table to be seen in Professor Beck's work on chemistry; precipitation; filtration; edulcoration; the antiseptic properties of charcoal; condensation of gases by solids and liquids; many of which subjects are treated of in an original manner by Mitscherlich, and it may be advisable to offer them at some future time, in order not to lengthen this essay too much. I now close the analysis of this first part of Mitscherlich's work, and proceed with the inquiry started at the commencement of these remarks.

A close and careful examination of the section on oxygen brings us to a very important conclusion as to the manner in which the science of chemistry may and ought to be taught. That there is at present a deficiency in regard to our elementary instruction in chemistry, every teacher is well aware, and hence in selecting a work for his classes, he chooses "that which is least exceptionable," thus plainly indicating the difficulty with which he has to contend; but so universally is nearly the same plan adopted, that almost every one arrives sooner or later, at the conclusion that "a student, when commencing, should have some previous knowledge of the subject." Now we are not to suppose our readers totally ignorant of numbers, nor destitute of a general elementary education, but we must suppose them ignorant of the peculiar nature of solids, liquids and gases, that there are invisible bodies around us whose properties render them tangible, that all the bodies seen in nature are composed of a few elements. We ought to suppose that they cannot properly distinguish between the metals, earths, or alkalies, and even that they have no definite idea of what a metal is; and yet, aware of this, how few give a course on chemistry, without preceding it by a long series on heat, light and affinity. In describing the conducting powers of solids, can the student fully understand the subject, when many solids are mentioned, which are quite unknown to him? Can he under like circumstances, fully comprehend the doctrine of the capacity for heat, the pressure of vapours, solution, distillation and the like? What does he know of the bodies quoted to illustrate these general laws, and without which they cannot be understood? Much less is he prepared to encounter the theory of flame, the construction of lamps and furnaces, subjects of great importance to every one, though they are necessarily lost, because the terms used in description, the essential terms have not been defined. But the most unaccountable of all seems to be the development at the commencement of a chemical elementary work, of the laws governing the combinations of bodies both by atoms and volumes. In the tables of elective affinity, what does the student know of sulphuric acid, of baryta, strontia, soda, &c. or of a salt, when he is ignorant of its constituents? He no doubt conceives one body to be pulling others with different degrees of force, but it is next to impossible he should have more definite ideas on the subject than this; and yet a reference to our chemical works will show that these doctrines are introduced, and being theoretic, the reasons for and against the theory are usually brought forward and illustrated by a multitude of examples. Experiments are at the same time instituted by way of proof; but I ask, does not this savour of the mystery of the adepts in alchemy, to exhibit a striking effect, and withhold the cause; for what difference is there between withholding the cause altogether, and explaining it in language known to be unintelligible.

But to proceed farther, can a student master the subtle doctrines of affinity, when those more advanced experience some difficulty in reasoning upon them? For example, the first law of Dalton, that "the composition of bodies is fixed and invariable, must be illustrated by a number of well selected facts. Suppose we take sulphuric acid, which is generally brought forward for this purpose. It is an acid; what notion does the beginner form of an acid? When exhibited to him, he conceives it to be something like an oil, which will corrode animal and vegetable matter. To show its bearing on the above law, he is informed that it is always composed (a novel idea to him) of 16 parts by weight, of sulphur, and 40 of oxygen, and that the sulphuric acid formed by the hand of nature ages ago, and that made

artificially at the present day, have precisely the same qualities. With what a multitude of new ideas is he here overwhelmed, that there is an invisible substance, which may be weighed out and made to mingle with a solid, so as to form an acid, in which we cannot detect one of the individual properties of the constituents. It were useless to give more instances, for every one must be struck with the impossibility of rendering a definition intelligible, where the defining terms are not understood, and with the inconsistency of teaching according to this method, while at the same time the instructors must be aware that all their efforts cannot be crowned with success. The remarks made on the first law of combination will apply to the two remaining laws, although the difficulties are increased ten-fold, and I would beg the attention of instructors to this subject; nay, more than this, as our science requires us to "question nature and she will answer us," so I would propose the same principle in this case. Let those interested in the inquiry, experiment for themselves; let them strike out a course founded upon the principle, that "a beginner is wholly unacquainted with the subject," and let them closely observe its effects upon the student, for in this, as well as in other kinds of knowledge, a reflecting and inquiring student often leads us to observations which might otherwise have wholly escaped us, and which may induce important results.

The system adopted by Berzelius, and founded on this principle, was eagerly seized by others, and advantageously extended by Mitscherlich in his Compendium, the commencement of which, the section on oxygen, and a few succeeding, were conceived and executed in a masterly style. He first exhibits an experiment, a fact, and then makes such deductions as naturally flow from it, making the student acquainted with names in connexion with facts. The constant mention of a great number of names, heard for the first time, and without knowing the properties of the substances named, only tends to create a confusion in the mind at the threshold of the science, in the very place where the utmost clearness and precision are requisite. Again, observation teaches us, and it is a received opinion, that we acquire ideas of things before abstract ideas, before we can reason on those things. This is a strong argument in support of my position, but is too generally acknowledged to require amplification.

The whole of Prof. Mitscherlich's Compendium is not conceived with the same energy, and only shows the difficulty of writing with a manifold object in view. For instance, a majority of the compounds described under the article carbon, might have been advantageously deferred to a future portion of the work; there existed no necessity for such diffuse remarks on the general properties of the solids, liquids, and gases, inasmuch as they break in upon the chain of elementary substances, turning the attention from the principal objects to those of minor importance, at least less so in the commencement. The article on organic analysis is wholly misplaced, and only intended for those much farther advanced in the science. The same might be said of many other portions of the work, which inevitably leads us to the conclusion, that it was written for different classes of hearers, and for different purposes. On this point, I refer to my remarks in the introduction to this paper, where I attempted to show, in a concise manner, that a work on chemistry should possess unity and uniformity of plan, object, and execution. Be this as it may, the present volume of Mitscherlich's Compendium is a valuable addition to the chemist's library.

*Philadelphia, May,* 1836.

## Bibliographical Notice.

*A Treatise on Astronomy, by Sir John Herschel, &c. &c. A new edition, with a preface, and a series of questions for the examination of students, by S. C. Walker.* Philadelphia: Carey, Lea & Blanchard. 1836.

The present edition of this popular work on astronomy is adapted to the use of students in academies, by the addition of a judicious set of questions for examination; a labour of the editor which will be appreciated by teachers. We have been much gratified by a perusal of the preface to this American edition, in which several interesting questions in astronomy are ably discussed. The principal of these are, the extension of the Newtonian law of gravity to the double stars, the correction in the mass hitherto assigned to the planet Jupiter, and the existence of a resisting medium throughout space.

In the first of these, the editor has done that justice to the labours of Sir John Herschel, which the author's characteristic modesty prevented him from doing, and further informs us of the result of some of his astronomical labours at the Cape of Good Hope. Both the other subjects are treated in a like interesting way, and the evidences in favour of the number assigned by the present astronomer royal of England, Mr. Airy, to the mass of Jupiter, are well put forth. The discussion in regard to the resisting medium, as evidenced by the acceleration of the three bodies most liable to its influence, known as Encke's, Biela's, and Halley's comets, leads the editor to the conclusion that "Encke's hypothesis of a resisting medium, is, according to the present state of the science, involved in new perplexities, for it is found, by trial, that no single estimate of the density of this medium, or of the law of its resistance will satisfy the observations of all three of the comets which are most liable to its influences."

The scientific, and even the general, reader, will find this preface to repay him for adding this edition to the former one, should he already possess it.

B.

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## Franklin Institute.

*Monthly Conversation Meeting.*

The seventh monthly conversation meeting of the Institute, for the season, was held at their Hall, March 24th, 1836.

John Vaughan, Esq., presented samples of sugar obtained from beets, and made some statements respecting the cost of its production in France, and the practicability of introducing the manufacture into the middle sections of the United States.

Prof. W. R. Johnson performed some interesting experiments with an electro-magnetic apparatus.

Mr. George Goodman exhibited a Ruthven printing press, of very neat form.

Mr. Hall Neilson exhibited several specimens of a dry, bituminous coal, from the state of Illinois, remarkable for the readiness with which it ignites.

*Franklin Institute Quarterly Meeting.*

The forty-ninth quarterly meeting of the Institute was held at their Hall, on Thursday, April 21st, 1836.

Thomas Fletcher, Vice President, presiding;

Isaac P. Morris, Recording Secretary, P. T.

The minutes of the last quarterly meeting were read and approved.

Donations of books, maps, and charts, were presented by Messrs. Carey, Lea & Blanchard; Adam Ramage; John C. Trautwine; Charles Roberts; Professor A. D. Bache, and Major Hartman Bache, of Philadelphia.

Donations of minerals, from Mr. John C. Trautwine, and Prof. W. R. Johnson, of Philadelphia, and from Mr. H. Neilson, of Richmond, Va.

John Vaughan, Esq., of Philadelphia, presented a specimen of sugar, made in France, from the beet.

The New York Gold and Silversmiths' Temperance Society presented a copy of their constitution and by-laws, and their certificate of membership.

Constant M. Eakin, Esq., of Philadelphia, presented specimens of zinc, made from the Pennsylvania ore, and of brass, made with the zinc, under the direction of F. R. Hassler, Esq., intended for the fabrication of weights and measures for the United States.

The Actuary laid on the tables, the periodicals received in exchange for the Journal of the Institute, during the past quarter.

The Chairman of the Board of Managers presented the forty-ninth quarterly report of the Board, which was read and accepted, and, on motion, referred for publication.

The Treasurer presented his quarterly report of the finances of the Institute, which was read and accepted.

Extract from the minutes.

Thomas Fletcher, *Vice President.*

Isaac P. Morris, *Rec. Sec. P. T.*

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*Report of the Board of Managers.*

The Board of Managers respectfully submit to the Institute, their orty-ninth quarterly report.

During the past quarter, the courses of instruction have closed, having been attended with their usual success. The want of accommodations, severely felt last year, has, however, tended to diminish the numbers of the class during the present year; a fact which should rouse the members to additional exertions in completing the arrangements for the new hall.

The Professor of Chemistry has evinced his ordinary zeal, and, amid the pressure of manifold professional engagements, has found time to devote to the instruction of his class. His lectures have given great satisfaction.

The Professor of Natural Philosophy has diversified the subjects of his course, even more than usual, during the past year, and his lectures have been well attended.

The Board return thanks to Mr. James C. Booth, for his volunteer lectures on the manufacture of porcelain. It is much to be regretted, that, among so many members of the Institute who are able to contribute to the information of their fellow members, so few are found to volunteer in the cause.

It will be the study of the Committee on Instruction, to endeavour to give more extent to the system of lectures, by supplying the nights vacant from the want of volunteer lectures.

The Drawing Schools have greatly flourished during the past year. The number of pupils in the two departments has been seventy-eight, many of whom have taken tickets for two quarters.

The apathy which has prevailed in regard to the English School, is calculated to discourage both the excellent instructor, who has presided over it, and the managers who have so often urged its claims upon the members.

As of great importance to the future welfare of the Institute, the Board proceed to notice the plan for extending the accommodations. The property of the masonic corporation, in Chesnut street, has been regularly transferred to the Franklin Institute. It has not been deemed prudent, under existing difficulties among mechanics, to go into the erection of a new hall upon this site at the present time. In the meanwhile, the committee who have charge of the property, will use it to the best advantage for the institution. The members should come forward liberally, to the full extent of each one's means and influence, to patronize the attempt to extend the usefulness of the Franklin Institute, by furnishing enlarged accommodations for its lectures, its schools, its library and reading rooms, its cabinets of models and minerals, and its exhibitions.

The contribution to practical science made during the past quarter, in the report of the Committee on the Explosions of Steam-Boilers, has been one of great importance, and may well excite the pride of the members. Public opinion will, it is hoped, be borne along with the final report of this committee, in their recommendations for preventing, or lessening, these disastrous accidents. For that report, the managers look with great interest.

The Committee on Science and the Arts have continued their useful labours in the examination of numerous inventions and improvements submitted to them. Their impartial decisions are, it is believed, highly esteemed by practical men. At their last annual meeting, the committee re-elected Professor A. D. Bache, Chairman for the ensuing year.

The new plan adopted for the Journal of the Institute, has met with considerable success. The same amount of matter on mechanics as formerly, is afforded, and, in addition, original and selected articles on Physical Science are admitted. The Managers again call the attention of the members to the fact, that their patronage of the Journal is by no means what it ought to be. Let no working man plead that he has not time to be a reading man. In the very important part which mechanics have to sustain, they must keep pace with the progress of mechanical science, or they will fall behind in estimation as a class. The Mechanics' Register, attached to the Journal, is not *heavy* reading, and, when more solid articles tire, cannot fail to amuse, as well as to instruct. The Editor, and the Committee on Publications, deserve and receive the thanks of the Board, for their united labours in behalf of the Journal.

The library has increased during the past quarter, by forty-five volumes on useful subjects. The cabinets of models and minerals have received a few additions. When there shall be more room to display their stores, it is hoped and believed that additions to them will be more frequent.

The number of members is increasing steadily. Since the last report, seventeen members have been admitted, and three have resigned. Mr. William Mason, and Mr. Thomas Ryan, have become life members of the Institute.

Herewith is presented the quarterly report of the Treasurer.

M. W. Baldwin, *Chairman.*

William Hamilton, *Actuary.*

## Mechanics' Register.

# AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN NOVEMBER, 1835.

*With Remarks and Exemplifications by the Editor.*

1. For improvements in *Manufacturing the Prussiates of Potash and Soda, and in dying therewith, and with certain other materials;* Felix Fossard, city of Philadelphia; an alien, who has resided two years in the United States; November 7.

Mr. Fossard obtained a patent for a purpose similar to the foregoing, on the 14th of December, 1832, and a second on the 3d of April, 1834; and in his present specification he has recapitulated parts of the former for the purpose of making more fully known the improvements which he has since made, which consist, mainly, in the "process of dying blue by the double decomposition of a soluble ferro-cyanate, or prussiate, and a salt of iron, or other metal," by processes which he sets forth, but which are not of a nature to admit of being epitomized, or presented at all in a form which would interest any one not immediately concerned in, and chemically acquainted with, dying processes.

2. For a *Machine for Cutting Straw, &c.;* Henry C. Jones, Salem, Warren county, Ohio, November 7.

There is nothing in this cutting machine to distinguish it from a score or two of others, and of this the patentee seems to be aware, as he says that "this machine is operated somewhat similar to other straw cutting machines;" after which he proceeds to claim certain things which are of little or no importance, and some of them, withal, not new.

3. For a *Conical Arch Charcoal Burner;* Ezra B. Gilbert, Ephratah, Montgomery county, New York, November 7.

The claim made is to the before described conical arch charcoal burner, for manufacturing charcoal. Excepting in shape, we do not see in what particular this kiln differs from that patented by Mr. Doolittle, in 1829, and described by him in the seventeenth volume of Silliman's Journal, p. 396. We have long had by us a model of a charcoal kiln, exactly in the shape of that now patented. The person who sent it proposed obtaining a patent, but declined doing so when informed that there was not any thing new in the principle of it, or in his mode of application.

4. For an improvement in the *Horse Rake;* James Pudney, Stanford, Delaware county, New York, November 7.

Two bars, each about seven feet long, are to have rake teeth fixed into them, at suitable distances apart, and about two feet long. These two bars are to be framed together by timbers at their ends, so that the two bars may be about two and a half, or three, feet apart. The teeth are to point in opposite directions, thus, *a* *a* *a* *a* where *a* *a* shows the points of the teeth, *a* and *b*, the timbers by which the two rake heads are framed together. When *b* the rake is drawn forward, one set of points is on the ground, the others serving as handles, by

which to guide it. When the rake is full, the upper ones are pushed forward by the person who guides it, and the rake rolls over, depositing the straw, grain, &c. The horse is geared to a frame, allowing of this rolling over, which frame is attached to the rake by headed pins, that pass through a slot in the timbers, *b*, which are double.

The claim is to the manner of using two heads, or rakes, and the self-adjusting slide, or groove, as the ends of the head bars.

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5. For a *Machine for Making Crackers;* Levin P. Clark, Baltimore, Maryland, November 7.

So far as we can judge from the description and drawing, this machine must be less efficient than some which have been previously patented and described; although the drawing is generally well executed, we cannot see how some portion of the operations described are to be effected, and cannot, therefore, make them known to others. The combination and arrangement are claimed, as is, *particularly*, a roller for turning the dough on to the moulds, &c.

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6. For a *Machine for Cutting Straw;* Ashman Hall, Kent, Putnam county, New York, November 7.

There is to be an angular knife, something like an inverted V, and this forms one of the claims; a claim is made, also, to a board, which is to gauge the length of the straw, and, lastly, to a spring to raise the sliding board; the angular knife is not new, and boards for gauging have been often used in a similar way.

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7. For a *Grist Mill;* Phillip Hauser, Cincinnati, Ohio. An alien, who has resided two years in the United States; November 7.

The grinding part of this mill consists of a common conical shell and nut, like those of the ordinary coffee-mill, without a single feature of novelty either in form or substance. The claim is to "the general arrangement and combination, but not to the parts, taken separately." It is one among those gross pretensions at invention which would excite much surprise, were they a little more rare.

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8. For a *Rotary Steam Engine;* John G. Hotchkiss, New Haven, New Haven county, Connecticut, November 7.

Abortive attempts at constructing rotary steam engines have been nearly as numerous as the attempts themselves; some of them, however, have evinced a great degree of skill, although unsuccessfully applied; but in the machine which forms the subject of the present patent, we do not perceive much waste of talent, nor any thing likely to disappoint any reasonable expectations. The whole scheme, in fact, is one which evinces an entire absence of elementary knowledge, on the subject of steam in particular, and of mechanics in general.

Steam is to be admitted through a hollow shaft into a revolving metallic drum fixed upon it; this drum has slots, or openings, on its periphery, through which the steam is to escape, and to strike against what are called "buckets," on the inside of a circular rim, by which it is surrounded, and which it nearly touches; the so called buckets are represented as grooves crossing the hollow rim, and formed like saw-teeth. This hollow rim has also slots, or openings, to allow the steam to pass through, and act upon a

second rim similarly constructed. Circular heads are to enclose the whole, excepting the last hollow rim, from which the steam may escape at the ends of each bucket.

"The principle of this improvement consists in the combination and arrangement of the steam wheels aforesaid, operating together in alternate opposite directions, by the direct and reacting force of the steam, as aforesaid."

9. For a *Smut Machine;* John Tuck, Columbus, Pennsylvania, November 7.

There is a stationary cylinder of sheet-iron standing on a suitable frame, its axis being inclined at an angle of about ten degrees with the horizon. Within this cylinder there is a second, which is made to revolve, the two being about three-fourths of an inch apart. They are both punched, grater fashion, their rough surfaces being towards each other. Within the inner cylinder there is a revolving fan wheel, extending its whole length. The grain is fed in at the upper end, between the two cylinders; the revolving of the inner one rubs the grain, whilst the wind from the fan, blowing through the apertures, discharges it, together with the cheat and cockle, the openings in the outer cylinder being made large enough for that purpose. The claim is to the machine generally, and "particularly to the shaft and spirally arranged wings for causing a current of air within the revolving drum."

10. For improvements in the *Art of, and Apparatus for, the transportation of Goods upon Canals and Rail-roads;* John Elgar, Civil Engineer, Baltimore, Maryland, November 7. (See specification.)

11. For *Canal Boats, to be propelled by steam;* John Elgar, Civil Engineer, Baltimore, Maryland, November 7.

A twin boat is to be made, the outer sides of each being vertical planes, parallel to each other. If an ordinary keel boat be supposed to be cut through the middle vertically and longitudinally, and the convex sides be then placed opposite to each other, leaving a space between them for a paddle wheel, the proposed form will be understood. It is supposed that such a construction will prevent the washing of canal banks. The claim is to "the straight external sides, with curved internal sides, of a twin steamboat, to be used on canals, and elsewhere."

There have been propositions and patents for similar boats, but we do not know of any now in use, nor do we believe that they will present the anticipated advantage. The water way between the boats becomes less and less as the greatest convexity of the two parts is approached, which causes the water to *pack*, and rise in front, which will occasion, we apprehend, nearly, or quite, as much swell as a boat of the ordinary form, and, at the same time, create a resistance which will consume a part of the power applied.

12. For *Counter Scales;* Elias A. Hibbard, Lunenburg, Essex county, Vermont, November 7.

A beam is made, one end of which is graduated like that of the steelyard, and the other supports a scoop, or scale, into which are put the articles to be weighed. The beam has a cross-bar, forming its fulcrum, and resting upon two uprights; below the scoop, or scale, there are suspending

links, with the necessary attachments for the scoop to rest on, and preserve the centre of gravity. The affair is imperfectly described, but the drawing shows the particular construction of the balance, which is certainly inferior to those imported counter scales, which have the weight above the beam, and which are now much used.

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13. For *Preparing Extracts of Bark for Tanning;* Otis Batchelder, Bedford, Hillsborough county, North Carolina, November 7.

The following is the recipe: "Put such quantity of the extract of the bark into the vat as may be required; then put upon the extract, vinegar, or some other acid, in the proportion of about two gallons of vinegar to the hundred weight of the extract; after that, put on water, cold or warm, in sufficient quantity to cover the extract; then pulverize and mix well, and then add such quantity of water as may be necessary, and the liquor is fit for use. What he claims as his improvement, is the method of dissolving in cold or warm water, with the addition of acid, instead of boiling, as has been heretofore done."

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14. For an improvement in the *Manufacturing of Horse Collars;* Henry C. Call, Sterling, Windham county, Connecticut, November 14.

This collar is, when finished, to be in the form of the most approved collars now in use; "the improvement consists in the process of cutting whole, and making without seam, or welt;" we are told, also, that "the pattern hereunto annexed is for the usual, or common, size;" but the drawing does not represent any such pattern, nor is any attempt at describing it made in the specification.

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15. For a *Revolving Screen for Cleaning Grain;* Edward P. Fitzpatrick, Mount Morris, Livingston county, New York. An alien, who has resided two years in the United States; November 14.

Instead of using woven wire, in meshes, as is usually done, this screen is to have wires running straight along it; of these there are to be several sections in the length of the screen, each section extending from one rim to another, which is fastened upon the axle for that purpose. The screen is to be inclined, and the grain fed in at the upper end, in the usual way; the wires in the first section are to be so close together as to allow only dust to pass; the next is to allow cheat to escape; the next small wheat, and the last large wheat. Between the two last it is proposed to form the cylinder of sheet metal, instead of wire, and to punch it full of smooth round holes, large enough for the discharge of cockle.

The claim is to the placing of rods, or wires, lengthwise of the cylinder, from one groove circle to the other, at suitable distances apart, for cleaning grain; instead of woven coverings, with numerous openings.

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16. For an *Anti-friction Box for the Hubs of Carriages;* Eyra Fisk and Joseph C. Green, Fayette, Kennebec county, Maine, November 14.

This anti-friction box is a modification of Garnett's friction rollers, of which we have had occasion to make frequent mention, as a similar contrivance has been repeatedly made the subject of a patent. In our notices of these contrivances we have never seen cause to commend them, especially when intended to be applied to carriage wheels, nor do we believe that they have in any instance, been really what they purported to be, improve

ments upon Garnett's; and as to the plan now before us, we think it very inferior to the original arrangement.

17. For a *Centrifugal Pneumatic Steam-Engine;* Charles J. Conway, city of New York; an alien, who has resided two years in the United States; November 14.

A very elaborate description of this engine is given, and the advantages expected to be derived from its use are fully set forth, but no claim whatever is made to any part of it; but we are not of opinion that this omission would have any tendency to vitiate the patent, as the general arrangement appears to be new. We are well convinced, however, that this is its only merit, and that we are not likely ever to see it in action, unless some accident should throw us in the way of its first trial, should not that have been already made.

The furnace is to be a revolving tube, surrounded by a case supplied with water for generating steam; this steam, and the gas from the fire are to rush out together tangentially from the periphery of a revolving drum, with a force which is to possess immense power. The fuel is to be supplied through the hollow axle on which the machine revolves, and is to be thrown into the furnace by centrifugal force. The averments of the specification contravene the known laws of mechanical and of chemical philosophy in more than one instance.

18. For *Cisterns, Reservoirs, &c. of Hydraulic Cement;* Levi Kidder, city of New York, November 14.

A pit is to be dug, of a circular form, and the bottom of it is to be covered with hydraulic cement, say to the depth of six inches; upon this floor is to be laid a cylindrical mould, allowing sufficient space between it and the earth for the thickness of the intended side wall, which space is to be filled in with hydraulic cement; another cylindrical section is then to be placed on the former, and the process repeated until the wall is of the required height. To counteract the external pressure from water in the soil, the cistern may be supplied with water from any convenient source, as the work proceeds. The claim is to the foregoing process; a claim which can be as well sustained as most of those previously set forth in patents for making cisterns of hydraulic cement; but no better.

19. For *Anodyne Alterative Syrup;* Rezin Thompson, Rome, Smith county, Tennessee, November 14.

Take 2 oz. extract of henbane,
14 oz. extract of walnut, or butternut,
2 oz. essence of sassafras, and
1 gal. simple sirop.

Dose for an adult, half a table spoonful, &c.

20. For *Raising Vessels from the Water for the purpose of Repair;* Rufus Porter, Bellerica, Middlesex county, Massachusetts, November 14. (See specification.)

21. For an improvement in the *Smut Machine;* Edward B. Fitzpatrick, Mount Morris, Livingston county, New York, November 14.

This smut machine is to consist of an outer stationary cylinder, standing

vertically, its periphery being formed of longitudinal rods or wires, placed so close together that grain will not pass between them, whilst the dust from the smut will escape readily. Within this there are to be revolving beaters formed by extending square iron rods from one set of cross arms on the lower end of a revolving shaft, within the cylinder, to other similar cross bars near the upper end of the shaft, and close within the heads of the cylinder; these rods are to be made ragged at their edges, and placed near together on the cross arms, extending from the shaft to the periphery of the cylinder. They are not to run directly along with the cylinder, but spirally, just as they would stand supposing them to be put in straight at first, and one of the sets of cross arms to be then turned half way round, thus giving a spiral direction to the rods.

The grain is to be fed in through the upper head of the cylinder, and to escape through an opening in the bottom head; but in passing down it is driven forcibly about by encountering the spiral beaters, the shaft of which revolves with great rapidity, and by this means, it is said, the smut is effectually removed.

The claim is to the above described manner of constructing a smut machine.

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22. For *Preparing and Using Elastic Japan for Leather;* William Gates, Hanover, Chatauque county, New York, November 14.

The japan is to be prepared by boiling two quarts of linseed oil until the yellow scum disappears, then adding two ounces of umber, and one of litharge, and boiling again for an hour and a half; after this the dryers are to be allowed to settle, and the clear liquor poured off. Eight ounces of India rubber, in shreds, are to be heated in a vessel with two quarts of spirits of turpentine; to these are to be added the two quarts of boiled oil and the compound is to be kept at a boiling heat until the gum is completely dissolved, which may be six hours. Eight ounces of asphaltum are then to be added and dissolved. This constitutes the japan.

The second part of the process consists in laying the varnish on the leather, which is to be done by a brush or sponge, and in the rubbing down and slicking, which are minutely described. The claims made are to "the particular method of compounding the japan so as to make it elastic, and at the same time permit it to dry readily; and the manner of affixing it to the leather."

We do not see any thing in the manner of compounding the japan, which is new to us, either as respects the materials employed, or the mode of treating them; nor is the manipulation of laying it on, rubbing it down, slicking, &c. generally distinguished from the plans heretofore followed.

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23. For a *Fire-place and Cooking Stove;* Joshua Douglass, Durham, Cumberland county, Maine, November 14.

This stove does not require description, as we could not possibly distinguish it from numerous others; the claims are to the "fire-place and jointed damper, as combined with the cooking stove, in the manner described."

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24. For a *Truss of Gum Elastic,* for Inguinal Hernia; Varnum Wilkinson, city of New York, November 14.

The distinguishing feature of this truss is said to be the formation of it without the employment of metal or of wood, in any part of it; the pad also

being different in shape from others. The patentee says that he had used India rubber before Dr. Heintzelman obtained his patent for a pad of that material, but we could point to trusses where not only the pad, but the strap also was of India rubber, made some years prior to Heintzelman's patent, which latter was not for the material employed, but for the particular manner of using it. The present patentee has left his description so vague and general as to be very far indeed from fulfilling the requirements of the patent law.

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25. For a *Machine for Extracting Hair from Skins;* Nahum Swett, Readfield, Kennebec county, Maine, November 14.

The skin is to be placed upon a revolving cylinder, to which it is to be attached, by means described in the specification, but very inadequately represented in the drawing. An elastic roller, covered with India rubber, which is again covered with leather, is borne up by spiral springs against the revolving cylinder, and the hair is to be taken off by means of a knife, fixed for that purpose. The claims made are to the particular manner of constructing the cylinder, and of fastening the skin thereto; the mode of constructing the elastic roller, and the general arrangement of the several parts.

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26. For a *Truss for Hernia;* Robert Semple, Concordia Parish, State of Louisiana, November 14.

The general construction of this truss is that most commonly employed, the improvement claimed being in "the construction and material of the front pad;" which is to be formed of wood, and to be covered with thin sheet lead, or a composition of lead and zinc. This, it is said, makes a block, or pad, so light as to be easily retained in its place, whilst the polished surface of the metal prevents the abrasion of the skin.

Hard substances have been so long used for pads to trusses, that a claim to them simply, would be unavailing. One with a pad of solid lead has been the subject of a patent. Ivory has been used for at least forty years, and is as smooth and light as one of wood covered with metal; we really, therefore, cannot perceive any ground upon which the present claim is to be sustained.

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27. For *Propelling Boats by a Spiral Screw;* Edward P. Fitzpatrick, Mount Morris, Livingston county, New York, November 23.

The shaft of this screw is to swell in the middle, so as to resemble two cones united at their bases, and the spiral thread by which it is surrounded is also to be wider at the middle than at the ends; the so making this screw constitutes the whole claim. The spiral screw propeller has been so often patented, tried and condemned; that its history, if written, would be one of disappointed hopes, which might well serve as a beacon to future voyagers. We do not believe that it can ever be made to assume a form by which it will be rendered efficient, and most certainly that given to it by the present patentee will not, in the slightest degree, redeem its character.

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28. For a *Cheese Press;* William C. Greenleaf, Andover, Oxford county, Maine, November 23.

A follower is to be forced down by a toggle joint, the pressure being continued by hanging a weight to a lever, or arm, attached to the joint. The patentee says, "I do not claim the original invention of the toggle

joint, but I do claim as my invention its application to the purpose of pressing cheese." Independently of the toggle joint having been previously used for the purpose, such a claim we esteem as altogether worthless, for if a claim to the "application" is valid, there may be as many patents for one press as there are articles to be pressed. The law grants patents for any "new machine."

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29. For a *Spark Catcher;* George Holbrook, Boston, Massachusetts, November 23.

We do not perceive any essential difference between this spark catcher and some others which have been previously patented. The sparks are to be arrested by coverings of wire gauze, and are to fall into a tubular reservoir surrounding the chimney. The arrangement of the coverings is somewhat different from that of others, but not to an extent which changes its character. The claim made is to "the manner of constructing and applying the frames as set forth."

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30. For a *Machine for Dressing Feathers;* Bartholomew Smith, Schodack, Rensellaer county, New York, November 23.

A tub of sheet iron is to be made, which may be six or eight feet in diameter, and its bottom is to be perforated with numerous small holes. A vertical shaft, which is to be made to revolve by means of a wheel, rises from the centre of the tub, and carries a number of curved whippers, or beaters, which are to act upon the feathers. A covering of sheet iron, or of any other suitable material, say of cotton ticking, is to rise above the tub, and to surround the beaters and feathers. Under the middle of the tub there is to be a small furnace for heating the feathers, the heat being confined, and reflected under the tub by a tin vessel, or casing. It does not appear that water or steam are to be in any way employed in the process. There is not any claim made, and the only difference which we see between this machine and others is in shape; to some of them it is certainly inferior, being less convenient, and neglecting an agent, steam, which is very advantageously employed in dressing feathers.

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31. For *Administering Medicine by Steam;* Benjamin Grut, city of New York, November 23.

Steam is to be conducted through certain herbs placed upon a strainer in a tin vessel, the vapour being led to the place desired through a tube in the top of the vessel.

"It is the method of disengaging and applying the medicinal virtues of plants, herbs, and roots, to a local part of the body, for which I claim a patent as my own invention, and not previously known."

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32. For a *Bedstead and Mattress combined;* Edmund Cherrington, Boston, Massachusetts, November 23.

Instead of the sacking bottom usually employed, tubes of metal, with worm springs and steel plates, are to support the mattress. The posts and rails are to be put together by dove-tail fastenings, which, if they differ from those formerly used, are not clearly explained. The claims made are to "the steel plates attached to the worm springs in the metal tubes, and the manner of applying the same; and the manner of putting the bedstead and mattress together, and fastening them with a dove-tail and button." The

manner of applying the steel springs, &c. is the same as in the next article, to which, therefore, we refer.

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33. For a *Spring to be used in Sofas, Chairs, &c.* Edmund Cherrington, Boston, Massachusetts, November 23.

We insert the whole description. "Two worm springs are enclosed in brass, or other metal, tubes; a steel plate of the length required, is attached to the hooks on the ends of the worm springs, and extends from the one to the other."

"What I claim as my invention, and not previously known, is attaching the steel spring as aforesaid, and applying it to the purposes above described."

Spiral steel springs are to be enclosed in tubes, like those of spiral spring weighing machines, and rows of these are to be placed along each side of the frame of the sofa seat, (or bedstead;) to these are hooked thin metal straps extending from side to side, like strained girths, and upon them the mattress. in the former patent, and the sofa seat in the present, are to rest.

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34. For improvements in the *Constructing of Rail Roads;* Elisha Johnson, Civil Engineer, Rochester, Monroe county, New York, November 23.

The patentee of the improvements which are described is, it appears, the Chief Engineer of the Towanda Rail Road, commencing at the city of Rochester, in the state of New York. The object proposed is to save a very large portion of the labour and cost in filling up when there are to be embankments. The whole description, with the accompanying observations occupy considerable space, and all that we can do, at present, is to give a general idea of the mode of procedure.

In passing through a well timbered district, where embankments are to be made, a road is constructed by fixing vertical blocks, or posts, of rough timber, squared at the ends; these may be 18 inches in diameter, and be placed ten feet apart, lengthwise of the road; upon them are to be placed round cross timbers, 12 feet in diameter and 9 in length; these, of course, being spotted to fit on to the uprights. Longitudinal pieces of round timber, not less than a foot in diameter, are to be hewn flat at top, and squared at the ends, in lengths of ten feet. Hard string pieces, 2 by 4 inches, are to be spiked on to the longitudinal pieces, and upon them the cars are to run. "The framed earth boxes are of a new and particular form, adapted to the purpose of completing the excavation and embankments; they are to have four, six, or eight wheels. Those with eight wheels have four earth boxes, one at each end, to dump endwise, and two in the middle, to dump at the sides.

The embankments are to be made by filling in along this temporary rail road, and it is to be continued in use until there has been a perfect settling of the earth, serving during this period, all the purposes of transportation; after which the permanent rails are to be laid in the usual manner.

The claims made are to the application of such rough timber as is at hand, in the way described. The use thereof for the purpose of embanking, and for transportation during the settling of the earth. The extending of the road into and through swamps and prairies; and the covering the whole of the timber with earth, excepting the ribbons on which the iron plates are spiked.

A large part of the specification is devoted to a display of the advantages

which are to result from the mode of procedure adopted; the means, however, by which results are attained, are the only things patentable. How much of the plan proposed is to be considered as new, is left to the judgment of those informed in the history of the construction of rail roads; we will remark, however, that we do not find any thing set forth in that clear and discriminating manner which is requisite to secure it under a patent.

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35. For *Machinery for Making Horse Shoes;* Henry Burden, Troy, Rensselaer county, New York, November 23.

The specification of this patent refers to three sheets of drawing, representing the machinery very clearly; it must be manifest, therefore, that we cannot here attempt a description of it in words. The machine is evidently constructed by one possessing much skill and knowledge in mechanics; and all the accounts we have heard of its performance, concur in representing it as effecting the intended purpose in a very perfect manner.

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36. For a *Spring Saddle;* Adam Hickman, Abington, Washington county, Virginia, November 23.

The claim made is to a "spring, which is attached to the hind plating of the tree, thence running to the under part of the cantle, and working on brass or steel plates, fastened to the under part of the cantle;" "which spring gives the cantle and steel bars an action similar to the operation of a bellows, the saddle itself being drawn over the steel bars."

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37. For a *Marine Hoisting Apparatus;* John C. Campbell, and Increase S. Withington, Boston, Massachusetts, November 26.

This apparatus, we are informed, is intended to raise sunken vessels; to float stranded vessels off shore; to carry vessels over shoals; and to raise them out of the water for repair.

"These objects are effected by sinking hollow boats, or casks, filled with water, and attached to the object to be raised, and then expelling the water by a forcing pump from the boats, or casks, and supplying its place with air."

The manner in which this may be done is described, presenting nothing new in principle, or in practice, but exhibiting the application of a mode of raising vessels which has been more frequently resorted to than any other, and that from time immemorial. The patentees, however, limit themselves to the particular construction of the apparatus described, their claim being to "the machine, or apparatus, herein described, as combined together for the purposes before mentioned."

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38. For an improvement in *Steam Boilers;* Thomas Ashcroft, Machinist, Boston, Massachusetts. An alien, who has resided two years in the United States; November 26.

This is a complex apparatus, consisting of a main vertical cylindrical boiler, surrounded by six, or any other convenient number of small boilers, each of which is to have its separate furnace. The main boiler may be a cylinder of thirteen feet in height, and two in diameter, closed at top, and at bottom. A casing round this boiler, and distant from it about three or four inches, extends up to the top of the main boiler, and is open for the escape of smoke, &c. Another case surrounds this, and is called the *steam*

*passage;* this is closed both at bottom and top, but communicates, by means of tubes, with the main boiler.

The six surrounding boilers are to be upright, and about three feet in height, their bottoms being about even with that of the main boiler; they consist of water compartments, surrounding the furnace, and receive their supply from the main boiler exclusively. The steam from each of them passes, through tubes, into the steam passage, and then into the main boiler.

The claim is to "the combination of boilers and apparatus before described, by which one main boiler of greater height, and less exposed to the heat, is enabled to supply water to one or more smaller boilers, which are more exposed to the heat, for the purpose of keeping them constantly full by the pressure of the column of water in the main boiler."

We cannot concur with the patentee in the idea that such a boiler can be made at less cost than one of the ordinary construction; great difficulty must be encountered in it, from the incrustation which will take place within the smaller boilers, but the anticipated circulation of the water will, it is calculated, prevent this, an effect to which we do not believe that it will be equal.

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39. For *Chilling the Interior Surfaces of Cast-iron Cylinders;* Henry Saunders, Dobb's Ferry, West Chester county, New York, November 7.

Conical boxes have been chilled on their inner surfaces by casting them upon solid metal cores, which are driven out whilst the iron is yet hot; but cylindrical metal cores cannot be thus removed. The present patent is taken for so constructing cylindrical metal cores, that they can be readily removed, leaving the cast cylinders smooth, true, and hard, on the interior.

To effect this object, the cores are to be divided, longitudinally, into two, three, or more, pieces, and these are to be kept together by collars passing over projections on their ends, for that purpose; conical wedges, or pins, are used to keep the pieces properly extended, by driving them into openings in the ends of the core. Those persons who have noticed the manner in which hat blocks are divided, to remove them from hats with enlarged crowns, will at once understand the principle adopted in the present case. The claim is to "all iron castings, of whatever form, size, or kind, having cylindrical interior faces, and which shall be chilled upon iron, or other metallic pins, composed of two or more parts, and divided longitudinally."

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40. For a *Mortising Machine;* John M'Bride, Richmond, Wayne county, Indiana, November 26.

In this machine, the chisel is made to advance upon the piece to be mortised, instead of causing the piece to move under the chisel. The chisel is to be acted upon by two compound levers, one of which is to be moved up and down by the hand. The fulcrum of the lever to which the chisel is attached, is on a kind of slide, which is caused to progress forward by a pall falling into a rack. The precise way in which this is effected is not clearly shown, and, indeed, there is considerable obscurity in the description of the machine in general, so that a workman could not undertake to make it from the information furnished. The claims would not serve to convey any definite idea of the things which are the subjects of them.

41. For *Turnabouts, or Platforms, for turning rail-road cars;* David Evans, Penn township, Philadelphia county, Pennsylvania, November 26.

This platform is to have conical rollers, by which it is to be sustained; arms extending from the centre, under the platform, upon which they are to revolve; and there is also to be a safety lever for arresting the platform, when it has arrived in the proper position.

The claims are to "the *conical balls*, with holes, or axles, and the guidance of them by the main centre, by means of the bars extending therefrom to the hoop on the outer circumference; and the self-tending safety lever, for regulating, or stopping, this, or any other, platform."

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42. For a *Sheet-iron Boat for Navigating Canals;* Leeman Parmelee, Poughkeepsie, Dutchess county, New York, November 26.

This patent is taken for making a twin boat of sheet-iron, as will be seen by the claim to invention, which "consists in the *sheet-iron twin boat*, for navigating canals by steam, or horse, power." There is not any thing peculiar in the formation of the boats, nor is there any thing new in making canal boats of sheet-iron; the invention consists, therefore, in putting two such boats together, exactly in the way in which twin boats of wood have been united.

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43. For a *Spring Saddle;* Charles Bates, Staunton, Augusta county, Virginia, November 26.

The spring of this saddle is exactly similar to such as have been made the subjects of two or three recent patents, from the same State, the principal change being the employment of two zig-zag springs, instead of one, and the fixing them somewhat differently in the iron frame within which they act.

The patentee says, "I do not claim the form of the zig-zag spring and frame; but what I do claim as my invention, is the peculiar mode of arranging and securing *two* springs to the movable bar, as above described."

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44. For an improvement on *Tub Water Wheels;* Edward Newnam, Hendricks county, Indiana, November 26.

This is a poor contrivance, poorly described, and as poorly represented. The design, however, appears to be to double the power of the water, by letting it on at opposite sides of the wheel. The affair is without a claim, and is not worth one.

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45. For an improvement in the construction of *Crucibles, Stove Cylinders, Grate Backs, &c.;* John Scott, city of Philadelphia, November 26.

This improvement consists "*in the use and application* of the inconsumable substance, *asbestus*, in the construction of crucibles," &c., "as follows. Let the asbestus be mixed with mineral substances, pulverized and moistened so as to form a thick clay, such as isinglass, soap-stone, black lead, and fire clay; and then let the mass be hardened by the action of heat, or by gradual drying."

The whole of the foregoing proceeds under the mistaken notion that asbestus had not been before used as a component part of the linings of furnaces, and the formation of other articles which are to bear high degrees of

heat. We have used, and seen it used, for such purposes, in numerous instances, and there is no experimental or operative chemist to whom the use of this material would be a novelty, and who would not have employed it, when at hand, without claiming to have made any discovery. "In Corsica it is advantageously used in the manufacture of pottery, being reduced to fine filaments, and kneaded up with the clay; the effect of which is to render the vessels less liable to break, from sudden alternations of heat and cold, than common pottery." Article, ASBESTUS, Encyclopedia Americana. This is the first authority to which we turned, but numerous others might readily be cited.

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46. For *Sheet-iron Fire Frames;* Gilbert Richards, Ashfield, Franklin county, Massachusetts, November 26.

The whole *invention* consists in making the sides, top, and front plate, of a Franklin stove, of sheet, instead of cast-iron, and the so doing constitutes the claim.

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47. For *Hulling and Cleaning Cotton, and other, Seeds;* John Ambler, Jr., city of Philadelphia, November 26. (See specification.)

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48. For an improvement in the *Hydrant;* Sater F. Walker, city of Baltimore, November 26.

The claim under this patent is to "the mode described of constructing and using the ascending tube, so as to discharge the waste water at pleasure, either above or below the surface of the ground; the mode of preserving the distance between the valve seat and screwed nut at the top; and the making a waste cock of metal with a wooden key, and leather interposed." It would require considerable space to explain the arrangements referred to, and as we understand that Mr. Walker is about to apply for a new patent for certain modifications of his apparatus, we shall wait until these come under our notice.

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49. For an improvement in *Grist Mills;* Samuel Hyde, Malone, Franklin county, New York, November 30.

This appears to be intended for a portable mill, although no dimensions are given. Both stones are to revolve in the same direction, the lower with a slow, the upper with a rapid motion. The lower stone is fixed upon a hollow shaft, and the upper upon a spindle which passes through it. The shaft of the lower stone runs upon "bead rollers," that is, upon round balls retained in a groove. The gearing we shall not attempt to describe, as this might be varied by any competent workman. The running both stones in the same direction, with different velocities, is claimed, and, for aught we know, this claim may be sustained; but we are uninformed respecting, and cannot perceive, any advantage which can result from this construction, whilst it is open to the objection of complexity. The "bead rollers," at the bottom of the exterior shaft, are claimed, but they have repeatedly been applied to shafts, although soon abandoned, as they are theoretically and practically bad.

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50. For an instrument for *Cutting Wood;* John Ruthven, city of New York. An alien, who has declared his intention to become a citizen; November 30.

This instrument is to be used as a substitute for mill, cross-cut, circular, and other saws. The cutting part consists of two steel edges, which are to operate like a paring chisel, taking off a narrow shaving, instead of tearing the wood by numerous points. A mortise is to be made on the edge of a blade, such a blade, for example, as would be fixed in a frame, in the place of a mill saw; and into this the cutters are to be secured, one edge pointed in either direction, so that the cutting may be effected both by the up and down strokes, the feed of the log, in this case, taking place at the termination of each stroke. In the circular saw, the cutters will, of course, all stand in the same direction, and the feed, we suppose, will be continuous.

When used for cross cutting, there are to be additional lateral cutters, to cut across the grain, like the fore iron in a cut-and-thrust, or a plane for cutting grooves across boards.

The claim made is to "the instruments described, and the method of cutting wood by them."

We very much doubt the general applicability of this method of cutting wood, instead of sawing it; a good mill saw may be fed half an inch at each stroke, whilst cutters, such as those described, cannot be allowed to cut more than an eighth of an inch, making a quarter in the double stroke. There will be a difficulty, also, in holding down the log in the up stroke, and the stuff will *spole* when the cutters arrive at the edges of the boards. The kerf, also, we apprehend, must be made thicker than with a good saw. The cross cutting appears to present other objections, which, with those already enumerated, we shall be glad to hear have been practically dissipated.

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51. For a *Spark Catcher*; James W. Waples, Wilmington, New Castle county, Delaware, November 30.

This spark catcher is to turn, like a vane, at the top of the chimney, a shaft passing up from the centre to sustain, and allow it to revolve. The part immediately over the chimney is covered with wire gauze, forming a segment of a hollow globe, but the whole is extended out on one side, so that the bottom of the spark catcher may be in the form of a long oval, the extended part being called the receiver; the covering of wire gauze is common to the whole, but that part in front, or rather to windward, is coarser than usual, to admit air the more freely, the other end, or receiver, acting as a vane, and keeping the whole in the proper direction. The two parts are united by a hinge at top, allowing the receiver to be turned up, to discharge the sparks, ashes, &c., when they have accumulated.

The claim is to "the before described spark catcher and receiver, and the mode of cleaning the receiver."

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52. For a *Reel to receive Water-proof Cloth as it is coated with the composition;* John Goulding and Reuben Brackett, Boston, Massachusetts, November 30.

The reel is to receive the cloth after it passes the reservoir by which one of its surfaces is covered with the composition, and is so constructed that the successive portions are kept from contact with those which preceded it. It consists of an axis, turning on gudgeons, and having at each end, within the uprights, six or any other preferred number of arms, standing at right angles thereto. These arms are notched on their edges, at regular distances, to receive the ends of rods, or cross bars, extending from one

to the other. The end of the cloth being properly secured, near the axle, the rods, as the reel is turned, are successively put into their places, and the sides of the cloth are thus kept separate, the whole forming a sort of hexagonal spiral.

The claim is to "winding cloth covered with dissolved India rubber, or water-proof composition, on a reel, at the time of coating, or after the operation of coating has been completed."

The circular tenter bars, described at page 19, vol. XVI, are an analogous contrivance, but not adapted by the arrangement of its parts, to the purpose to which the present reel is applied.

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53. For a *Diving Dress;* John Read Campbell, Boston, Massachusetts, November 30.

This is said to be an improvement on the diving suit patented by Nathaniel Wolcott, on the 17th of April, 1834, which has been assigned to the present patentee. One notice of that patent may be seen at page 330, vol. XIV. The improvements proposed are the making the cap, or case, for the head, entirely of glass, to increase the field of vision, and the encircling the body by a metallic case, under the India rubber cloth, to prevent compression. The philosophy of some of the appendages described, we do not comprehend, nor can we discover that any of the ordinary difficulties in the use of such dresses are more completely obviated than by previous contrivances.

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54. For a *Kiln for Drying Grain;* Thomas Crook, New Hope, Bucks county, Pennsylvania, November 30.

This patent is taken for an improvement upon a kiln for the same purpose, patented by Benjamin Parry, in the year 1810. In this kiln, it appears that the grain was fed into an inclined pan, contained in a chamber heated by a furnace and flues, the pan being agitated by a roller to cause the grain to descend regularly along it. The present patentee uses two pans, one above the other, and inclined in reverse directions, the grain falling from the first into the second; he suspends his pans by chains, and agitates them by a roller in a more convenient manner than heretofore. The claims made are to "the manner of arranging a second pan under the first, for the purpose described. The manner of strengthening the pans, as above, and the method of supporting them at the outside, by swing chains, instead of a roller."

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55. For a *Hot Air Forge Hearth;* Richard Walker and Leonidas V. Badger, Portsmouth, Rockingham county, New Hampshire, November 30.

A box is to be made which consists of two parts, standing at right angles to each other; one of these constitutes the back, and the other the bottom of the forge. Each of the parts may be a foot square, and two and a half, or three inches deep. The air is blown in in the usual way, and traverses back and forth several times, between partitions, before it arrives at the tuyere. The claim is to "passing the wind under and back of the fire, making a complete hot air blast." At least one-half of this claim is invalid, as the air has already been heated by a similar box at the backs of forges, if not under them.

56. For a Machine for *Cutting Straw;* John Wirt, Evansham, Wythe county, Virginia, November 30.

The whole of this apparatus is confessedly old, with the exception of "a cog wheel on the shaft of the cutting and fly wheel, working in the teeth of the crown wheel, on the end of the lower feeding roller, for feeding the machine." The same purpose has been effected by similar means, and that forty years since.

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## Specifications of American Patents.

*Specification of a Patent for Improvements in the Art of, and Apparatus for, the Transportation of Goods upon Canals and Rail Roads. Granted to* John Elgar, *Civil Engineer, Baltimore, Maryland, November 7th,* 1835.

To all whom it may concern, be it known, that I, John Elgar, of the city of Baltimore, in the state of Maryland, have invented certain improvements in the art of, and in the apparatus for, the conveyance or transportation of goods, on a line where canals and rail roads form alternate links in the chain of communication, as for example, on the great Pennsylvania line from Philadelphia to Pittsburg; a part of which invention, or improvement, may be applied to the construction of, and transportation in canal boats, on those lines in which the mode of conveyance is by water alone; and I do hereby declare that the following is a full and exact description of my said improvement, or invention.

The object which I have in view in the first instance, is to prevent the necessity of removing the goods from the vehicle within which they are first loaded, by constructing cases which serve on rail roads as car bodies, and on canals as boats. This I effect by making such vehicles, or car bodies, of sheet iron, in the manner of iron tanks, riveting them up water-tight in the same way. The dimensions of these bodies must be determined by that of the canal locks, through which they are to pass when used as boats. If, for example, the lock will admit a boat of fourteen feet in width, and eighty in length, the bodies may be made seven feet wide and twenty feet long, so that eight bodies, two abreast, and four in length, may pass at the same time. I intend sometimes to make the bodies wholly of sheet iron, but they may be made of that material to the height of about three feet only, with an additional height, say of three feet, made of wood. The bodies when made of this length are to be carried upon eight-wheeled cars. If four-wheeled cars are preferred, the bodies must be made of a length suitable thereto, and a greater number of them will then, of course, be connected together, when in the water.

As these bodies are, by their combination, to form canal boats, the requisite number of them are to be so formed at one end as to constitute a well shaped bow, and the same number are to be so shaped as to constitute a stern; the other ends are to be made square, so that when connected by proper fastenings they will be in one continuous inflexible line, to the length of the lock through which they are to pass.

It is a well known fact that the resistance to a boat moving through the water, is nearly as the cross section of the part immersed, without regard to length; and I contemplate the obtaining a great advantage from the application of this principle in the conversion of my car bodies into canal boats,

as they are to be made but half the width of an ordinary boat, their draught being the same, their cross section will be but one half; I contemplate, therefore, the coupling of these bodies together in one continuous line, without placing them side by side, excepting when they are passing through locks, by which means but one half the power of traction ordinarily required will be found necessary, the foremost and the hindmost bodies constituting a stem and stern.

The great length given to the combined boat in this case, will render it necessary to make provision for passing along those parts of the canal where there is any considerable curvature. For this purpose I construct a certain number of the bodies in such a manner as that when coupled so as to constitute a canal boat, they will form a rule joint, which will allow of the requisite lateral motion to conform them to the curvature of the canal. To make such a joint, the end of one of the bodies composing it must terminate in the concave arc of a semicircle, and that of the corresponding one in a convex semicircle, adapted to each other. The distance apart of these flexible joints should be equal to that of an ordinary canal boat, so that when detached they will pass side by side through the locks.

These rule joint sections are to be coupled together by a connecting bar which falls, or is placed, on a strong upright pin, fixed in the centre of the circumference of the joint, or in any other convenient mode.

To cause the boats so connected to conform to the curvature of the canal, and to steer them by making one act as a rudder to the other, I fix a wheel and pinion, or adapt a lever, or other power, at each rule joint, so as to communicate the requisite degree of flexure. A compound boat of any desired length may thus be formed and managed, the first of the series of sections, only, being bow formed, and the last, only, stern-formed.

The bodies may be transferred from the cars to the water, and from the water to the cars, by means of powerful cranes; but the mode which I intend in general to adopt, is to extend the rail way down into the canal basin, in the manner practised in marine rail ways; the bodies may thus be made to float from, and on to the cars, with the utmost facility.

The rule joint, and mode of steering, I also intend to apply to canal boats of the ordinary construction and length, but reduced in breadth one half, so that in passing through locks the boats may be disconnected at the joints, and pass through in pairs, side by side, thus obtaining the advantage before alluded to as resulting from the diminution of the cross section, and admitting of an increased velocity with a decreased injury to the banks of the canal.

What I claim as my invention in the within described art of, and apparatus for the conveyance or transportation of goods on lines of canal and rail road, is the constructing of car bodies in the manner set forth, so that they may be converted into canal boats, upon the principle, and for the purposes herein fully described and specified. I also claim the connecting of such, or other canal boats, by rule joints, for the purpose of adapting them to the curvature of the canal, and of steering them by their action upon each other, upon the same principle with that by which a rudder is made to steer an ordinary boat.

JOHN ELGAR.

*Specification of a Patent for an Apparatus, and Mode of Using the same, for Raising Vessels for the purpose of Repair. Granted to* RUFUS PORTER, *Bellerica, Middlesex county, Massachusetts, November 14th,* 1835.

Four square timbers, eighty feet in length, are placed parallel to each other, and so arranged that the space between each pair is ten feet, and the whole breadth across the four is forty-feet. Across these are placed, at equal distances, seventeen other timbers, forty feet long, being firmly secured to the first four by tree-nails, and over these last is placed a strong plank floor; the whole constituting a stage, or platform, eighty feet in length, and forty in breadth. This platform rests on four square trunks, each being thirty feet long, ten feet wide, and ten feet deep. These trunks are constructed of framed timbers and plank, and are closed and made water tight on all-sides, except an open space of ten feet in length, by four in breadth, in the centre of the bottom of each, and are placed under the four corners of the platform, between the long timbers above mentioned, so that only the cross timbers rest on the tops of the trunks. The platform is further supported by braces extending diagonally from the sides to the trunks, and also connected by iron rods crossing from one to the other. The platform and trunks, which thus connected I call the elevator, being put into the water, or rather having been constructed afloat, a sufficient quantity of stone is placed on the iron rods to cause the whole to sink when filled with water.

Two scows, each eighty feet long, and eight feet wide, are kept in attendance, one of which floats over each side of the elevator; and ropes being attached to the four corners of the elevator, or to arms projecting therefrom, are also made fast to the bow and stern of each scow, thus preventing the elevator from sinking below a certain depth, say twelve feet below the surface of the water. Each scow contains, besides a small steam engine, of one horse power, two hollow cylinders similar to the cylindrical boilers of high pressure engines, each cylinder being thirty feet long, and thirty inches in diameter. From each of the four cylinders a piece of leather hose extends to one of the four trunks, being firmly attached to each. These cylinders being charged, by the power of the steam engines, with fifteen atmospheres of compressed air, the vessel to be raised is floated between the scows, or if the vessel lays at anchor, the scows may be propelled by the steam power, to a station on each side of the vessel, dragging the elevator with them, which is then raised by the ropes until the middle of the floor comes in contact with the keel of the vessel, and is secured in that position by several ropes or chains, which being attached to the sides of the elevator, are made fast to the timber heads of the vessel. Moreover, several chucks, or blocks, previously prepared and connected with the elevator, are placed under the bottom of the vessel to support the same in its position when raised. Then, by means of valves, the compressed air in the cylinders is permitted to escape through the hose into the interior of the trunks, which immediately gives them a buoyancy of about seven hundred thousand pounds. But if the vessel thus raised be of such a size as not to require so much power of buoyancy, the compressed air may be instantly shut off, whenever the floor of the elevator shall have risen fairly above the surface of the water.

While one vessel is being repaired, the cylinders are again charged; and when the repairs of one are completed, other valves are opened, which

permit the air to escape from the trunks, while the vessel settles readily, but gently, into the water, and the elevator is ready to receive another; thus avoiding the ordinary delay attendant on raising vessels by the usual method.

I claim the construction and mode of using the elevator generally.

RUFUS PORTER.

*Remarks by the Editor.*—We have been induced to publish the foregoing specification entire, because it describes the thing patented with a directness and clearness which may serve as an example to others. There is nothing extraneous about it, and we could scarcely, therefore, have done any thing like justice to it had we epitomized it in the ordinary monthly list. There is nothing new in the principle of raising vessels by means of air forced into hollow trunks, but the whole arrangement set forth gives a distinct and special character to the plan before us, by which it can undoubtedly be sustained.

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*Specification of a Patent for a Machine for Hulling Cotton and other Seeds. Granted to* JOHN AMBLER, JR. *City of Philadelphia, November 26th,* 1835.

To all whom it may concern, be it known, that I, John Ambler, Jr. of the city of Philadelphia, in the State of Pennsylvania, have invented an improved machine for hulling and cleaning cotton and other seed, which I denominate the Metallic Cotton Seed Huller, and that the following is a full and exact description thereof.

Upon an iron shaft, revolving horizontally, I place two, or any other convenient number of steel or iron disks, or circular plates of metal, so as to run with perfect truth upon the shafts; disks of eighteen inches in diameter, I have found to answer the purpose perfectly well. By means of a pointed chisel I raise teeth, in the manner of rasp teeth, on each side of these revolving disks, or I groove, or roughen them in any other manner calculated to produce the intended effect. The disks, as they revolve, pass through the flat bottom of a hopper, by which they are surmounted, projecting above the said bottom about one third of their diameter. Steel plates, cut like the disks, are placed on each side of them; the upper edges of these plates are on a level with the bottom of the hopper, and they extend down to the lower part of the revolving disks, covering about one-fourth part of the face thereof, this having been found sufficient to effect the hulling, perfectly. These lateral plates are attached to adjustable sliding bars, or fixed in any other way which will admit of their distance from the disks being regulated according to the kind of seed to be hulled. It has been found best not to increase the opening between the plates and disks at the upper edge, but to preserve their parallelism throughout, so that but one seed can find its way between them at a time.

The seeds and hulls fall upon a sloping skreen, or riddle, which is made to shake, and to carry the portion which does not pass through the riddle to a revolving picker, placed at one end of the frame; this picker, and the hollow segment within which it revolves, are set with teeth in the manner of a picker for wool, and serve to separate the matted portion of the hulls, cotton, and seed, so that the lighter portion may be driven off by a revolv-

ing fan placed at the lower part of the machine for the purpose of cleaning the hulled seed.

The riddles, screens, shakers, fan, &c. which I employ, do not differ from such as are in common use for cleaning grain and other seed, and do not, therefore, require to be particularly described, as they make no part of my invention, and may be variously modified, or used separately from the hulling apparatus.

What I claim as my invention, and wish to secure by letters patent, is the hulling of cotton, and other seed, by means of revolving disks, or plates of steel, or other metal, made and operating substantially in the manner hereinbefore set forth.

JOHN AMBLER, JR.

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**Progress of Theoretical and Practical Mechanics and Chemistry.**

## *Economy of Steam Power.*

As this subject has latterly begun to attract the general attention it so well deserves, it is evidently of much importance that the nature of the recent improvements in question should be well understood, in order that their practicability, or rather *expediency*, under different local circumstances, should be properly appreciated.

Some persons appear to consider that the expansive working of high pressure steam, constitutes the *only* improvement by which the expenditure of fuel is so greatly economised in the Cornish engines. It is, therefore, very natural to state that considerable power is lost in obtaining this advantage. To a certain and limited extent this may be true, but the improvements in question consist, in great measure, of *other arrangements*, against which no such objection can be urged, and from which, therefore, unmixed benefit is derived, as I shall presently endeavor to show.

Although the expansive working of high pressure steam in the manner introduced by Mr. Woolf, is undoubtedly a very important feature in the Cornish steam engines, in their present improved state, their superior excellence and economy, is by no means to be attributed to *this source only*, as several other causes greatly contribute towards it. These causes are the following:—1st, An improved construction of boilers, by which the generation of steam is more rapidly and more perfectly effected. 2nd, in allowing a short interval between each stroke, by which means the condensation of the steam is perfectly accomplished. 3rd, (perhaps the most important feature,) the prevention, to a very great extent, of the usual escape of heat from those parts of the engine through which the steam passes, by the application of a *proper casing composed of substances known to be very imperfect conductors of caloric.* In this casing the boiler, steam pipes, and cylinder, are, of course, carefully enveloped. 4th, The great care and attention used in working the engines; all parties concerned being stimulated to exertion by the admirable system of publishing regular monthly returns of the duty, &c. of all the engines working in the county.

On the 3rd of these causes, or the application of casing, I lay much stress, both on account of its actual importance, and also of the ease and small expense with which it may in all cases be applied to engines, although not originally constructed with this intention. It appears, indeed, from experiment, that by this simple alteration (or rather addition) only,

that the duty of an engine may be nearly doubled, or, in other words, *its expenditure of fuel reduced one-half, without any diminution of its power*, a fact well deserving the attention of those who are concerned in the use of steam engines, whether in places where coal is expensive or not.

It is sometimes supposed that the engines now used in Cornwall, are constructed with two cylinders, in the manner introduced by Woolf—no engines of this kind have been employed there, however, for many years; all of those now working in the county being impelled by steam acting expansively in a *single cylinder*, as first proposed by Watt, although of course of great elasticity, in accordance with Woolf's great and acknowledged improvement.

It is doubted how far it would be prudent to adopt these improvements in the neighborhood of Glasgow, where coal is abundant. As the application of them of course involves some degree of expense, this is strictly a *matter of calculation*, and not of opinion; but, when the expenditure of fuel can be reduced one-half, (which I am convinced in many cases might be done,) by the simple application of casings in the manner before noticed, and without any loss of power, there is, I think, good reason for supposing that *this improvement, at least*, would be desirable in all situations, however cheap fuel may be. The waste of coal, arising from the unchecked radiation of heat in the engines used in our coal mine districts, must be enormous, nor can any thing be conceived more barbarous (unless, indeed, the *mere destruction of coal* be one of the objects in view) than the construction of the engines in the mines of Staffordshire, and other coal districts. The boilers are generally made of a somewhat spherical form, much resembling those employed in the earlier atmospheric engines, and, together with the steam pipes, stand detached from the engine house, and quite exposed to the air, having no roof or covering whatever. It is evident that an immense escape of heat must take place from these enormous surfaces, exposed as they are to all atmospheric changes. I have never ascertained the temperature of the outside of these boilers by a thermometer; the surface is, however, too hot to be approached by the hand, and as the exterior can only differ from the interior by refrigeration (certainly, under these circumstances, a rapid process) we may, perhaps, conclude, from the known conducting power of the metals, that it may even approach 200 degrees.

The following memoranda, made some time ago in Cornwall, will show how differently things are managed there.

United Mines, Little engine—a 30 inch cylinder—

| | | |
|---|---|---|
| Temperature of external atmosphere | . . . | 67 deg. Fah. |
| Ditto of engine-room | . . . . | 68 deg. Fah. |
| Ditto of boiler-house | . . . . | 70 deg. Fah. |

Cardozo's Engine—a 90 inch cylinder—

| | | |
|---|---|---|
| Temperature of external atmosphere, as before. | | |
| Ditto of engine-room | . . . . | 71 deg. Fah. |
| Ditto of boiler-house | . . . . | 75 deg. Fah |

Consolidated Mines, Job's Engine—a 90 inch cylinder—

| | | |
|---|---|---|
| Temperature of external atmosphere as before. | | |
| Ditto of engine-room | . . . . | 70 deg. Fah. |
| Ditto of boiler-house | . . . . | 72 deg. Fah. |

These observations were made quite at random, nor were the best engines in the mines selected for that purpose, as there were others of superior construction and doing better duty. They will serve, however, to show

the extraordinary success with which casing is applied by the Cornish engineers, an improvement perhaps of greater general interest than any other, from its extreme simplicity, and the ease with which it may be applied in all cases where economy of fuel is desirable. FREDERICK BURR.

*London Mining Journal.*

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*Instances of Spontaneous Combustion, detailed in a paper read before the Royal Irish Academy, 25th May,* 1835. By M. SCANLAN, ESQ.

In the beginning of last March, a fire broke out in the extensive turpentine distillery on Sir John Rogerson's quay, belonging to Mr. John Fish Murphy, which is separated from my chemical factory by Windmill Lane. The fire, which was speedily got under, was confined to a heap of what is termed, by turpentine distillers, chip cake, and from the circumstances under which it occurred, could not be attributed to any other cause than the act of an incendiary, or to the spontaneous ignition of this chip cake.

As spontaneous combustion of this substance has never occurred before in Murphy's distillery, nor in that of his father, an extensive distiller of turpentine for many years, at Stratford in Essex, I at first doubted that the fire could have originated in this way; however, on inquiry, I found his mode of working had been, on this particular occasion, different from that usually employed in his distillery, and, experiments which he kindly permitted me to make, have since proved beyond doubt that combustion did take place spontaneously.

Raw turpentine, as it comes from America, in barrels, includes a considerable quantity of impurity, consisting of chips of wood, leaves, and leaf stalks.* It was the practice in Mr. Murphy's distillery, as it is in England, to heat the raw turpentine up to a temperature of about 180°, as I found by plunging the thermometer into one of his large copper pans, and to strain the turpentine, thus liquified, from the impurities, previously to introducing it into the still, where it is submitted to distillation in the usual way, with a portion of water, yielding turpentine oil, which distils over along with the water, and rosin which remains behind in the still. The chips when separated by a wire strainer, still retain a quantity of adhering turpentine worth saving, and with this view are transferred to a large close vat, where they are exposed for some time to the action of steam furnished by a boiler kept for this purpose, as well as for steaming the empty barrels, in order to remove any turpentine that may adhere to them. Still, however, the chips are a good deal imbued with resinous matter, and in this state form a loose porous mass, which the turpentine distiller calls chip cake, a material which is used by the poor in the neighborhood as fuel.

As long as the process I have just described was pursued, which is the London mode, and that which produces the best rosin, no accident occurred from fire in Mr. Murphy's premises, although I have frequently seen

* The following extract from the letter of a French turpentine merchant, will account for the presence of these foreign bodies. To obtain the turpentine "the fir timber is chopped about a man's height down its side with an axe, not hand deep, and afterwards higher up. The turpentine or *rosin* is scraped up from the foot of the tree. That which is on the side wound, when scraped off, is white, and is called *galley pot*, of which the burning incense is made. It does not yield so much turpentine spirit as the pat."—*Ed. of Records of Science.*

immense heaps of this chip cake collected together in his yard; but, on making trial of a different plan, namely, that practised by a Dublin distiller, Mr. Price of Lincoln Lane, the accident in question occurred.

On this occasion the raw turpentine, together with its impurities, was put directly into the still, along with the proper quantity of water, and the boiling rosin at the end of the operation strained from the chips.

The chip cake resulting from a single operation thus conducted, was laid in a heap outside the still house at 3 o'clock in the afternoon, and at midnight was discovered to be in flames.

In the first mentioned process, it is obvious the chips were never exposed to a higher degree of temperature than 212°; but in the latter, especially when it is the object of the manufacturer to make amber rosin, the temperature to which they are exposed is much higher.

The first experiment I made was on the 16th March. I found the temperature of the boiling rosin, in the still, to be 250°, when the turpentine oil and water had been distilled off, the fire just drawn from under the still, and when the liquid rosin was in the act of being strained from the chips which were introduced into the still with the turpentine.

I had the whole of the chip cake resulting from this distillation carried into my own yard, upon a wire screen, and left in the open air, with a view of watching its progress.

The temperature increased gradually in the centre of the heap, although externally it became quite cold and brittle. In four hours, in fact, a thermometer thrust into the centre of the *porous* mass indicated a temperature of 400°, a good deal of vapour was now given off, and the adhering rosin in the heated parts began to acquire a high colour; the smell could be perceived at a considerable distance from my premises; it was a mixed smell of pitch and rosin.

The chip cake, in this experiment, was first exposed to the air at one o'clock in the afternoon, and though it rained during the night, at half past seven the following morning it burst into a flame.

In a second experiment, I placed the chip cake in an open tar barrel, having three holes bored in its bottom, about two inches in diameter each, and it did not take fire till the expiration of thirty-six hours, but the temperature of the mass was lowered by removal from the wire strainer to the barrel, and besides, I am of opinion the limited access of air retarded the combustion.

In a third trial which I made, combustion took place in five hours; but in this experiment the temperature of the boiling rosin drawn from the still was 260°, and the chip cake was laid, as in the first experiment, on the wire screen; the wind, too, was very high. The screen, in this case, was raised a few inches from the ground, in order to let the rosin, as it melted, drip away, which it did in abundance.

It appeared to me as if the porous mass became slowly red hot, in the centre, like a pyrophorous, and as if the vapour and gaseous matter arising from the decomposed rosin which lay immediately beneath, were inflamed on coming in contact with it. I was standing by when it suddenly burst into flames, and I thought, at the time, had the melted rosin been permitted to drop into water, or had it fallen to such a distance as not to be kept liquid by the radiant heat of the red hot mass above, that there would have been no flame, but silent combustion.

I have since learned from Mr. Price, in whose distillery it has always

been the practice to put the unstrained turpentine into the still, that he was well aware of the fact which it is the object of this paper to record, from a fire having occurred several years ago on his premises, when in the possession of his predecessor, Mr. James Price, and that, ever since, they cool down the chip cake, immediately on removal from the still, with water, and afterwards use it as fuel under the still.

An instance of spontaneous combustion occurred with my friend Mr. Philip Coffey, of the Dock Distillery, which is worth relating while on this subject.

He had made a quantity of the mixture used in the theatres for producing redlight, a powder consisting of nitrate of strontian, sulphur, chlorate of potash, and sulphuret of antimony, with a little lamp-black. A paper parcel of this "red fire," of about a pound or two by weight, was left by him on a shelf in a store-room where there was no fire or candle-light; the following day, while reading in an adjoining room, he perceived a smell as if some of this powder were burning, and, on examination, he found it had ignited spontaneously on the shelf and was actually consumed.—[*Records of General Science, and Rep. Pat. Invent.*

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*Engraving on Copper in relief.*—This art has fallen very undeservedly into neglect. Nitric acid, with one fifth of muriatic acid, forms the best mixture for biteing in.

To prepare the copper, cover it with fine pumice-dust and water, and rub with a piece of fine pumice stone, rubbing with a curved motion. When the whole surface is uniform, clean the plate carefully. The plate is now to be coated with a cement prepared as follows: pure and clean asphaltum, is coarsely powdered, and four ounces added to four of Burgundy pitch, previously heated to fluidity in a suitable vessel: the materials are well mixed and exposed to a gentle heat sufficiently long to vaporize all the water of the pitch. Six ounces of white wax are next added and the whole is gently heated until it has attained such a fluidity that on cooling it will have a proper consistence: a very important point in regard to it. The fluid is then poured upon a copper plate to cool, and broken into small pieces for use.

The cement just described is dissolved in oil of turpentine, then spread with a brush or pen upon those parts of the plate which are to stand out. With a steel point these lines are cut down to the proper degree of fineness.

When the cement is dry, make an inclosure by engraver's wax upon the plate, into which pour dilute nitric acid, and allow it to act as long as is necessary. Next clean the plate and with a roll of paper dipped in the cement give a coat of ink to the parts of the design. Bite in with stronger acid, and when the plate has again been inked and worked up with the grain, bite in with nitro-muriatic acid.

This operation affords an engraving in high relief and which may be worked off with very little touching. (*Jour. des Connaiss. Us. Prac. Aug.*)

*Densities of Metals affected by Wire Drawing, &c.*—In a memoir some of the conclusions from which have already been given in this journal, M. Baudrimont gives the following estimates of specific gravites, founded upon very delicate experiments. *Iron.*—Wires compressed, 7.6305; do. annealed 7.600; do. laminated 7.7169; do. annealed, laminated 7.7312; hammered iron 7.7433. *Copper.*—Button cooled slowly, 8.4525; wire compressed,

8.6225; do. annealed 8.3912; do. laminated 8.4931; do. annealed, laminated, 8.4719; hammered copper 8.5079. *Silver.*—Button slowly cooled, 10.1053; button laminated, 10.5513; hammered 10.4476; granulated 9.6323; brittle 9.8463; crystallized in plates 9.5538; wire of .007 inch diameter, 10.4913. *Annales de Chim. et de Phys. Vol. IX.*

*Preparation of Sugar from Starch.*—M. Guerrin Varey, gives the following process for preparing sugar from starch by the aid of malted barley. One hundred parts of starch are mixed in four hundred parts of cold water, the mixture is poured into two thousand parts of boiling water, and rapidly stirred. From this results a thin paste which is cooled to about 150° Fah. and an extract of thirty-five parts of barley, which has germinated, mixed in. Cold water is added. The temperature being kept at 140° to 150° Fah. the mass liquifies in about five minutes. Having been heated for two hours and a half, between the temperatures already named, the liquid is evaporated at the lower limit of temperature in vacuo, if possible, until it marks 34° of Baumé. It is then exposed to the air in shallow vessels, and in a few days yields a sirop which sometimes contains crystals. The sugars may be crystalized by treating with alcohol to purify them, and evaporating in vacuo. Animal charcoal is also used to deprive them of colour. *Ibid.*

*Liquid for Bronzing Medals.*—Water of ammonia ½ oz. nitre ½ oz. dry sea salt ½ oz. sal ammoniac 1 oz. vinegar 48 ounces.—*Jour. des Connais Us. et Prac. Sept.* 35.

*Substitutes for Platinum Points.*—Alloys which may be substituted for platinum points to lightning rods. Platinum 1, Zinc 1, Brass 1, Copper 6. Platinum 1, Mercury 1, Zinc ½, Brass ½, Copper 6. These alloys oxidate with difficulty.* *Ibid.*

## Civil Engineering.

*Proportion of drainage to fall of Rain.*–The following deductions are made from two interesting tables, containing the fall of rain and the amount of drainage in Eaton brook and Madison brook valleys, in the State of New York. They are taken from a report of John B. Jervis, Esq., Chief Engineer of the Chenango Canal, to the Canal Commissioners of the State of New York.

From table No. 1. it appears, the average drainage, from June to December, 1835, inclusive, (7 months,) was 0.392 of the falling water or nearly ⅔; and the average from June to October, inclusive, (5 months,) was 0.319, or nearly ⅓ of the fall: August is the minimum month, and shows a drainage of 0.192, or nearly ⅕ the fall: July is the maximum month, (except December, which drained the snow of November,) and a drainage of 0.414, or over ⅔ of the fall.

From table No. 2, it appears, the average drainage for the year 1835, including the snow on the ground on the 1st of January, was 0.449, or nearly half the falling water: January to May, inclusive, (5 months,) 0.662, or say ⅔ of the fall: June to October, inclusive, (5 months,) 0.246, or say ¼ of the fall. It will be observed that the quantity drained from June to

* *Query.* Will they replace platinum in difficulty of fusion? if not, the points would become knobs, by powerful discharges.

October, inclusive, was very uniform; although the falling water is very different; which causes a great range in the ratios for the several months. This was produced by the reservoir on Madison brook, which retained the flood waters, and discharged them nearly uniformly through the reservoir pipes, causing the highest ratio to appear in the month of the least fall, and the smallest ratio in the month of the greatest fall of water. It is therefore obvious, that an average of June to October, (5 months) will be required to give a proper view of the drainage during the season of the greatest evaporation.

From June to October the Eaton brook valley gave a drainage of 0.319, and Madison brook valley 0.246 of the falling water. This result, it is believed, has been produced by the different characters of the two districts drained. The Eaton brook valley is, in itself, very narrow, and the grounds that drain into it are, generally, quite steep, and the soil is mostly of a very close texture. The Madison brook valley is much wider, the slopes of the adjoining lands that drain into it are more easy; and the soil, in some parts, is more porous than that on Eaton brook. In both cases the country is cultivated, and presents the usual proportion of cultivated and timbered lands, that is generally considered necessary in farming districts.

The Eaton brook valley, I should think, would afford more than an average drainage over a large district of the country, including the usual varieties of soil; and the Madison brook would, probably, not differ materially from the general average.

The calculations which the undersigned originally submitted on this subject were based on a drainage equal $\frac{1}{3}$ of the falling water, which the experiments thus far show to have been too low. The average for the year, for the Madison brook valley, is 0.449, or over $\frac{2}{5}$ of the falling water; and if we assume the drainage on Eaton brook, during the winter months, to be equal to that on Madison brook, for the same time, (which may be taken with safety,) the average for the year would be 0.523, or over half the falling water.

*Rail Road from Hartford to the Canadian line.*—The following is an extract from the proceedings of a convention held at Windsor, Vermont, for taking measures in regard to a Rail Road from Hartford, Connecticut, to the Canadian line.

The committee to whom was assigned the resolution directing an enquiry into the practicability of constructing the contemplated Rail Road from Hartford, in Connecticut, to the Canada line, through the valleys of the Connecticut and Passumpsic rivers, in reference to elevation, soil, materials, &c., and to estimate the expense of the same, beg leave to report:—

That, in their opinion, the same is highly practicable; that they have had under consideration the survey of Mr. Hutchinson through the valley of the Connecticut river from Hartford, in Connecticut, to McIndoe's Falls, in Barnet, Vermont, near the mouth of Passumpsic river, a distance of 220 miles, and the survey of De Witt Clinton, Jr. from thence to the Canada line on Lake Memphremagog, a distance of about 65 miles, showing a plan and profile of the country, surveyed for a canal on said route, being the same which is now contemplated for a Rail Road. Knowing those gentlemen to be professional engineers of high respectability, your committee have not hesitated to come to the conclusion, unanimously, that, so far as rise and fall are to be regarded, no unusual obstacle is presented; that, for so great an extent, the route is uncommonly level, and that there is no one point of

obstruction in the whole extent which may not be readily overcome, and that without serious expense.

That, in reference to the soil, in addition to the knowledge possessed by the committee individually, they have acquired such information as has been within their reach, and feel confident in affirming that throughout the whole route, the earth is feasible and of easy excavation; and that all the materials for constructing a rail road are found abundant and cheap upon every part of the line.

Your committee report, in reference to the expense of constructing said Rail Road, on the most permanent and improved plan, similar to the Boston, Worcester, and Providence roads, that the cost of superstructure, exclusive of grading, will be eight thousand dollars per mile, for a single track, including turn-outs; and that the grading, on an average, will not exceed five thousand dollars per mile for a double track, including masonry, bridging, engineering, and all contingent expenses. But, considering the abundance of timber in the vicinity of the route, suitable for constructing a rail road, and the facility for obtaining the same, other plans equally practicable and far less expensive might be advantageously adopted. The superstructure of the road with timber, without rubble-stone, might be constructed for six thousand dollars per mile less than the estimates of a road similar to the Worcester and Providence roads.

| | |
|---|---|
| The estimated expense of a road, the whole distance, constructed upon the plan first mentioned, would amount to | $3,705,000 |
| Upon the last mentioned plan, | 1,995,000 |
| Making a saving in expense of | $1,710,000 |

It is well known that the surveys of Messrs. Hutchinson and Clinton were made for a then contemplated canal, and, of necessity, must have been confined to the streams; but in a survey for a Rail Road it seems highly probable to your committee that the route will be varied in many essential particulars.

Your committee further report, from the best information they have been able to obtain, that the route from the line of Canada to St. John's, a distance of about seventy miles, intersecting the Champlain and St. Lawrence Rail Road, is highly practicable and through a level and fertile country, and that from the well known enterprise of the inhabitants of the Eastern townships in the Province of Lower Canada, should the now contemplated Rail Road be extended to the Province line, a communication would soon be opened from that *terminus* to Montreal, and that the expense of constructing the same will not exceed the foregoing estimate; and they further report, that there is another route, in contemplation from the province line, through the valley of the St. Francis to the St. Lawrence, in the direction of Quebec, which is represented to be equally practicable, and affording equal facilities.

*Thames Tunnel.*—The excavation made for the Thames Tunnel is about 38 feet in width, and 22 feet six inches in height, presenting therefore, an opening exceeding 850 feet. The whole of this excavation including its two sides, which may be computed at 400 feet, is secured by means of a powerful apparatus designated the shield, as is also the roof it, which measures 350 feet. At full tide, the weight of both earth and water, which constitute *the superincumbent pressure*, is not less than 700 tons.

The *ceiling* of the shield consists of 24 or 26 pieces of cast-iron, donom

inated staves, closely adjusted; and as they are sometimes made to relieve each other, and therefore subjected to an increased load, they are for greater strength made like inverted troughs of cast-iron; their breadth is 18 inches, the depth of their sides 7 inches, and their length 9 feet, independently of a tail of wrought-iron which overlays the brick work. The edges in front are made sharp for entering the ground, and the external surfaces of the staves are planed very true. Similar staves are laid against the sides of the shield, all planed and equally well adjusted; each stave can be impelled singly as sheet piles are. Upon the whole the shield may be viewed as a coffer-dam, which, instead of being moved in a perpendicular direction, is placed and impelled horizontally. The standing part of the shield consists of 12 parallel frames, all independent of each other.

The front of this vast excavation is protected in a different manner from that of the sides. It is paneled all over with small boards, each of which is 3 feet long and 6 inches wide. There are, therefore, upwards of 500 of these boards, technically called *polings*, for covering the whole face of the excavation. Every one of these polings is held in place, and secured by means of two hand-jacks or screws, abutting against the frames. There are, therefore, upwards of one thousand of these jacks in action for securing the face of the excavation, or rather, for pressing against the ground with sufficient power to prevent any disruption of its various strata; for were the ground to be at all deranged, the pressure against the sides and front of the shield might soon increase to 2,500 or 3,000 tons, independently of that of the superincumbent pressure.

It is further to be remarked, that every successive tide, which at its full head is 76 feet above the foot of the excavation, causes an incessant variation in that pressure, tending to strain the hard strata, and to soften or knead the intervening soft ones; a fact quite unnoticed by projectors of plans, but which proved fatal to those who attempted the drift-way under the Tames in 1808. The pressure exerted against the front of the excavation by the agency of the shield, must therefore be uniformly kept at a maximum. The shield is advanced only 9 inches at a time, while the brick structure proceeds simultaneously.

It would be well if those who feel disposed to enter the List of Competitors were first to consult the report of those miners who directed the attempts that were made and carried on with so much perseverence, between the years 1803 and 1808, with the ultimate object of opening a roadway under the Thames at Rotherhithe. These were miners (Cornishmen,) engineers in that branch of the art, and, consequently, eminently qualified for the task in every respect; they were as sanguine too, as any of the projectors of this day; and their excavation was limited, in the first place, to a simple driftway, the height of which was only 5 feet, the breadth 2 feet 6 inches at the top, and 3 feet at the bottom, forming, therefore, an excavation that was sixty times smaller than the excavation which has been made for the Thames Tunnel. Diminutive, however, as this hole was when contrasted with that of the tunnel, the ground of the roof, though supported by substantial planking, gave way once in a fluid state, leaving an unsupported cavity over the roof of the driftway; still it held itself up; but a second accident of the same nature having occurred under a very high tide, the river broke the ground and entered the drift. In both cases it was the loose ground that first forced its way into the drift, and the river afterwards. The miners succeeded in filling the hole and in re-entering the drift, but the men could not continue the working; they were, according

to the engineer's report, *driven out of it by the frequent bursts of sand and water*, and it was acknowledged by him to be quite impracticable to proceed farther; so, after having probed the ground from underneath in many places, he concluded and reported that it was impossible to make an excavation of any size under the Thames.

But he resorted to one expedient which he conceived would answer the emergency—one which, at any rate, demonstrates the intrepidity of this engineer. That is, in order to clear or pass through the place which had been filled up in closing the hole made by the breaking in of the river, he reduced the height of his drift from 5 to 3 feet. The men and the engineers, too, had therefore to work on their knees. Awful enough for such a task! Thus reduced, the area of the excavation of this drift hardly exceeded the one-hundredth part of that of the Thames Tunnel under corresponding circumstances. [*London Mechanics' Magazine.*

*General Statement of the Business of the Schuylkill Navigation Company, since its commencement.*

In 1815–16–17, no receipts. In 1818, total tolls, 233 00 dolls; in 1819, 1,202 16; in 1820, 803 07; in 1821, 1,792 60; in 1822, 1,054 97; in 1823, 1,964 38; in 1824, 635 00.

| Years. | Total tonnage. | Tons of coal. | Toll on coal. | | Toll on other articles. | | Total toll. | |
|---|---|---|---|---|---|---|---|---|
| | | | *d.* | *c.* | *d,* | *c.* | *d.* | *c.* |
| 1825 | | 6,500 | 9,700 | 00 | 6,075 | 74 | 15,775 | 74 |
| 1826 | 32,404 | 16,767 | 25,147 | 00 | 18,961 | 87 | 43,108 | 87 |
| 1827 | 65,501 | 31,360 | 33,317 | 00 | 24,832 | 74 | 58,149 | 74 |
| 1828 | 105,463 | 47,284 | 46,202 | 00 | 40,969 | 56 | 87,171 | 56 |
| 1829 | 134,524 | 79,973 | 77,032 | 00 | 43,007 | 00 | 120,039 | 00 |
| 1830 | 180,755 | 89,984 | 87,192 | 00 | 60,973 | 95 | 148,165 | 95 |
| 1831 | 196,413 | 81,854 | 78,781 | 00 | 55,224 | 32 | 134,005 | 92 |
| 1832 | 327,921 | 209,271 | 199,784 | 00 | 65,045 | 70 | 264,829 | 70 |
| 1833 | 445,849 | 252,971 | 228,138 | 00 | 97,348 | 00 | 325,486 | 63 |
| 1834 | 395,720 | 226,692 | 204,490 | 14 | 95,350 | 91 | 299,841 | 05 |
| 1835 | 535,194 | 339,508 | 310,475 | 19 | 120,168 | 45 | 433,643 | 64 |

| Years. | Descending toll. | | Ascending toll. | | Amount of rents. | |
|---|---|---|---|---|---|---|
| | *d.* | *c.* | *d.* | *c.* | *d.* | *c.* |
| 1825 | 13,363 | 74 | 2,412 | 00 | 4,700 | 00 |
| 1826 | 32,968 | 97 | 10,139 | 90 | 4,900 | 00 |
| 1827 | 42,865 | 27 | 15,284 | 47 | 6,967 | 00 |
| 1828 | 64,001 | 56 | 23,170 | 00 | 7,618 | 00 |
| 1829 | 92,186 | 00 | 27,853 | 00 | 10,574 | 00 |
| 1830 | 105,231 | 36 | 42,934 | 59 | 13,800 | 00 |
| 1831 | 99,995 | 52 | 34,010 | 40 | 13,750 | 00 |
| 1832 | 218,218 | 00 | 46,611 | 70 | 15,207 | 00 |
| 1833 | 263,744 | 00 | 61,743 | 63 | 16,673 | 00 |
| 1834 | 246,266 | 14 | 53,574 | 91 | 16,687 | 67 |
| 1835 | 362,861 | 36 | 70,782 | 28 | 17,898 | 54 |

## Progress of Physical Science.

*The Time Ball at Greenwich.*—The followipg is a description of this apparatus.

*C*, the ball.

*A D*, a square mast on which it traverses, projecting through the eastern turret, *t*, *t*, of the observatory, and through the centre of the ball.

*m m*, the lead flat of the great room of the observatory.

*O B*, a circular iron plate, in which the mast is stepped, and which is steadied by the roof of the turret at *g*.

*F G*, an iron rod, to the upper part of which is fixed a part of the mast, and to the lower part, the piston, *G*. The upper end of this rod is of larger diameter than the lower.

*I*, an iron cylinder, with a stop-cock at *q*; the base, *a a*, on which it stands, being the level of the floor of the great room.

*R S T V*, the discharging rod.

*V*, the cock, and W, the trigger, for discharging the ball.

*M*, the winch for raising the ball.

*N*, the chain for lifting the ball, and passing over the pulley at *O*.

*H H*, a strong iron plate, fixed in the wall, on which stand the two iron rods, *I I*, and which are fixed at the top, in the circular plate, O B.

*k*. These rods guide the piston rod, and also an iron weight, K, (passing through the lower part of it,) to the back of which weight is fastened the end of the lifting chain, *N*, after passing over the sheave at *O*.

The construction of the mast, and the manner in which the ball is made to traverse up and down it, is as follows.

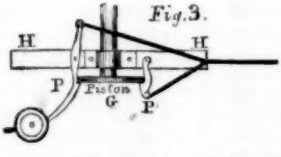
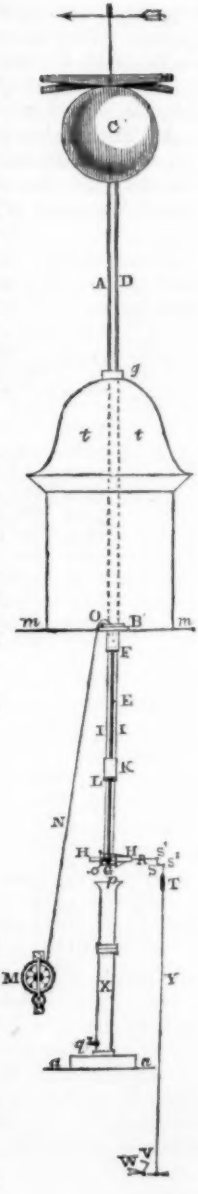



*Fig.* 3.

*Fig.* 2.

Fig. 2, represents a section of the mast at *d*, which will assist in explaining its construction. *c* is a solid piece of deal, (the whole length of the mast;) *d* and *e*, two other pieces screwed to it. The three angular parts, *h g f*, thus left, are filled by pieces extending the whole length, and firmly screwed in their places; but the part *o* is fitted by a piece, the upper end of which is secured to the upper part of the ball, and the lower end to the top of the piston rod at F.



When the ball is down, the weight, *K*, to which the chain is fastened, rests on the iron plate, *H H*, and the top of the piston rod, *F*, rests on a projecting piece at the bottom of the weight at *L*. The chain being fastened to this weight by means of the winch, is made to draw it, and, with it, the piston rod and ball.

The piston, *G*, being raised (as shown in the figure) to the iron plate, *H H*, forces its way between two detents, *P P*, which open and close on it, and thus support the ball.

The discharging rod, *R S T Y*, has a crank at S, with two joints at $s^1$ and $s^2$. T is a box, containing a strong spiral spring; the rod *Y* is secured to the bottom of this box, but the part of the rod above the box *T*, and below the crank at *S*, has a short movement within the box, in connexion with the internal spring. The purpose of this spring is, by acting against the ascent of the ball, when it is raised to the mast-head, to accelerate its descent when let fall, thereby preventing any adherence to the mast, and giving it rapid motion immediately.

*V*, the discharging part, has two notches, which serve to fix it at half and whole cock, in the same manner as the lock of a gun. When the ball is to be raised, the handle at *V* is raised to the half-cock; this raises the rod, *G*, and pushes the part, *R*, and prepares the detents, *P P*, for receiving the piston, which detents open, and are closed by means of the crank and the spring at *T*. When *V* is raised to the full cock, it compresses the spring, and exerts a greater force in keeping the detents closed. When the trigger, *W*, is pressed down, to discharge the ball, the rod, *G*, descends, and draws the part of the rod, R, to the right, which, removing the detents, *P P*, from beneath the piston, allows it to drop into the cylinder. The piston being adapted to the size of the cylinder, as it descends, compresses the atmosphere, and a resistance is thus obtained sufficient to break the fall of the ball, with its supporting rod in the mast. A brass cock at the bottom of the cylinder regulates the escape of the atmosphere beneath the piston, so as to allow the fall of the ball to be more or less, as required.

Fig. 3 shows, on a larger scale, the plan on which the detents are constructed.

When the ball is first raised to the mast-head, the weight, K, is at *F*; for the shoulder of the piston at *F*, resting on the rim of the weight at *L*, is thereby raised up with the ball. But before the ball is discharged, the lifting chain is entirely unwound, and the weight, *K L*, thereby descends, and rests on the plate, *H H*, in order to give the piston and ball freedom to descend.

During the time that it has been used, the ball has always been observed to commence its descent with 0.2s. after the impulse has been given to the trigger.

The time of discharging the ball is at the instant of one hour, P. M., mean time at Greenwich.

The mast is surmounted by a weathercock, and letters pointing to the four quarters of the compass. [*Lond. Naut. Mag.*

*Occurrence of the Aurora Borealis at Toronto.*—Capt. Bonnycastle, R. Engineers, states that "during the winter months, on Lake Ontario, the aurora may be said to be almost a constant companion of the dark and cheerless nights, and it occasionally presents itself at all other times of the year." He notices a remarkable constancy in the figures of the annual arches, as seen at Toronto, Upper Canada, and the constant appearance of the meteor in the arched form.

A splendid aurora occurring on the 11th December, 1835, is described and beautifully illustrated. [*Silliman's Journal, vol. XXX., No.* 1.]

*Machine for Registering the Variations of the Tide and Wind.*—The general principle of the machine is such, that a circular dial being fixed to the axle of a clock, revolves with a uniform motion once in twenty-four hours; a pencil is also moved vertically up and down by the rise and fall of the tide; which combined motions of the dial and pencil trace a curve upon the face of the dial, whereby the height of the tide, at any particular period of time, may be ascertained; also the time of high and low water, and the variable rate of ascent and descent.

The direction of the wind is indicated by a circular dial, fixed horizontally to the vertical axis of a wind-vane; and, by means of the clock, a pencil is made to move uniformly, at a given rate, from the centre of the dial, towards the circumference, so that, if the wind remain stationary upon any point of the compass, the mark traced by the pencil will be a straight line, radiating from the centre of the dial; but if the wind be changing, the dial will revolve, and the combined motions of the dial and pencil will trace out a curve, by which the direction of the wind, at any particular period of time, will be indicated. [*Jameson's Journal.*

*Colour of the sky as seen from high mountains.*—M. Bousingault comparing his own observations upon several high mountains, is disposed to attribute the blackness which the sky sometimes presents, to the effect of strong light reflected from the snow and ice upon the eyes. He observed a remarkable difference of tint in the sky seen from the highest point of Chimborazo which he was able to reach, and from the plain. On the ascent of Antisana at a much lower elevation, the sky seen from the icy plain appeared black, and in the evening of the day of observation he was struck with snow-blindness.

In no ascent has he been able to see the stars in day time, an experiment which he made fully in his ascent of Chimborazo. [*Ann. de Chim. et de Phys.*]

*Height of Barometer, &c. near the top of Chimborazo.*—On his ascent of Chimborazo, M. Bossingault found the barometer to stand at 14. 47 inches at 2 P. M., the thermometer being at 46° Fah. The height above the level of the sea was 6004 metres (6670 yards.) [*Ibid.*

*Expansion of Liquified Gases, &c.*—The very remarkable fact of the expansion of liquified carbonic acid, lately observed by the French academicians, has been fully verified by Mr. Kemp, lecturer on chemistry, who finds that the expansion is not peculiar to this liquified gas, but belongs to all other gases in the liquid state. At a meeting of the society of arts, Mr. Kemp exhibited a specimen of the liquified sulphurous acid gas, hermetically sealed in a glass tube, and separated from the materials from which it had been generated. This specimen of the liquified gas occupied eight inches of a tube, five-eighths of an inch in internal diameter, and when cooled from the temperature of 60° down to 14° of Fahr., or the point at which it becomes liquid under the ordinary pressure of the atmosphere, it contracted one inch; but when heated an equal number of degrees above 60°, viz. 46°, it expanded through a greater distance than it had before contracted, by the abstraction of an equal amount of caloric, showing that the expansion went on at higher temperatures in a slightly increasing ratio, so that the expansion between its liquifying point, viz. 14° and 212°, the boiling point of water, is nearly one-third of its whole volume, the pressure against the

expansion being at 212°, about twenty-five atmospheres. That this property does not belong to the liquified gases exclusively, but resides equally in all other fluids, when raised above their boiling points, is shown by the following experiment; thus, ether, when raised from the temperature of 60° to 95° of Fahr., or its boiling point, undergoes an inconsiderable expansion compared with the expansion produced by an equal increase of temperature above its boiling point, when it may be said to be in the same condition with the liquified gases, in regard to pressure, and suffers nearly an equal expansion, by an equally increasing temperature with the liquified gases. [*Jameson's Jour.*

*Arsenic in English Sulphuric Acid.*—Vogel, of Munchen, infers, from his experiments on sulphuric acid:

1. That the Nordhausen acid, prepared from the sulphate of iron, contains no arsenic; the precipitate with sulphuretted hydrogen being pure sulphur.

2. Concentrated English sulphuric acid, prepared in leaden chambers, contains arsenic, and the precipitate produced in it by a current of sulphuretted hydrogen, consists of sulphur and orpiment.

3. No precipitate of sulphur takes place, in consequence of a current of sulphuretted hydrogen being passed through English sulphuric acid, diluted with from four to six parts of water; the precipitate consisting of an orange yellow powder, or orpiment.

4. Rectified English sulphuric acid contains no arsenic, this substance remaining in the residue. The rectified acid, diluted with water, is not rendered muddy by sulphuretted hydrogen. The German sulphuric acid, diluted with water, becomes white when the latter gas is passed through it, as it always contains sulphurous acid.

5. The arsenic always exists in sulphuric acid in the form of arsenious acid, never as arsenic acid.

6. Concentrated boiling sulphuric acid can dissolve one-third of its weight of arsenious acid, of which the greater part separates on cooling. The arsenious acid may be precipitated, in a great measure, from the concentrated sulphuric acid, when cooled, by absolute alcohol, although it is somewhat soluble in alcohol.

7. Lastly, it is absolutely necessary that in all preparations to be used internally, rectified, or, at least, German, sulphuric acid, should be employed. [*Thomson's Rec. of Sc.*

*On the Mineral Waters of Nevis.*—M. Robiquet attributes the principal virtue of these waters to an organic substance heretofore described by M. Longchamps, and called *baregene*, but which M. Robiquet refers to the vegetable kingdom as an organised matter. The nitrogen which enters into the constitution of this plant, is derived, according to the same writer, from atmospheric air, existing in cavities through which the waters pass. When the spring water is first drawn nitrogen escapes, and the water, notwithstanding its high temperature 112° Fah. retains a mixture of nitrogen and oxygen, in which the latter element is in greater proportion than in atmospheric air. [*Ann. de Chim. et de Phys. vol. LX.*

*Analysis of the waters of the Gray Sulphur Springs.*—The springs "are situated among the spurs of that portion of the Allegheny mountains which passes through Virginia, on the borders of Monroe and Giles counties." The waters analysed by Prof. Shepard, of South Carolina College, have yielded Nitrogen, Chlorine, Carbonic Acid, Sulphuric Acid, Hydro-Sulphuric Acid, Silica, Crenic Acid, Soda, Lime, Alumina, Iron and Sulphur.

These constituents, he states, from his examination, exist probably as Nitrogen, Hydro-Sulphuric Acid, Bicarbonate of Soda, a super Carbonate of Lime, Chloride of Culcium, Chloride of Sodium, Sulphate of Soda, an alkaline or earthly crenate, or both, Silica, Sulphuret of Iron, per crenate of iron, Alumina, Silicate of Iron. [*Silliman's Journal, vol. XXX. No.* 1.

## Mechanics' Register.

*British Projects for* 1835.—The following abstract is made from an article in the London Magazine of Popular Science, for February, 1836, where the particulars are given at large:

Number of projects relating to steam, ten; amount of capital required, 1,889,000*l.* Gas, three projects; capital required, 295,000*l.* Mines, forty-one; capital, 3,006,200*l.* Railways, thirty-seven; capital, 35,424,000*l.* Miscellaneous, thirty; capital, 9,343,000*l.* Total capital required, 49,957,200*l.*, or nearly $204,000,000! A few of them are foreign schemes.

*Desiderata in the Construction of Stage Coaches.*—The greatest possible height of all the wheels; greatest possible depression of the body; shortness of perch; length of axletrees; diminution of bearings and tires; length and pliancy of springs. [*Parnell on Construction of Coaches. Rev. in Lond. Mag. Pop. Sc.*

*Beet Root Sugar.*—At the recent meeting of the German naturalists, at Bonn, the section of agriculture and rural economy was almost entirely occupied with papers and discussions on this subject. At Valenciennes, a manufacturer has succeeded in discovering a method of crystalizing the whole of the saccharine matter of the beet, without producing molasses in the process. [*Ibid.*

*Harrison's Chronometers.*—It is stated that Harrison, of London, received from the government for his chronometers, at different times, sums amounting to one hundred and ten thousand dollars. [*Naut. Mag.*

*Hint to Dyers.*—A practical dyer of Troyes, in France, asserts that the acetate of iron is much preferable to the sulphate, in dying blacks. That stuffs which are injured by washing in caustic leys, or even soap, may be cleansed by rubbing in a weak starch bath. [*Bulletin Soc. d'Encouragement, &c.*

*Hint to Bleachers.*—The same individual states that muriatic acid, used instead of sulphuric, in decomposing bleaching salts, does not render woolen goods harsh, as is often the result of the common acid bath. [*Ibid.*

*Cast-iron Piano.*—The society for encouraging the arts at Rouen, France, have awarded a premium to Messrs. Eder & Gaugain, for a piano, the frame of which is of cast-iron. The strength of this material, in proportion to its bulk, gives it advantages over wood. [*Ibid.*

*Experiments on Hydraulic Cements.*—The society for the encouragement of national industry in France, have appropriated six hundred francs for experiments on the different hydraulic cements. [*Ibid.*

*Preserving Marble by Wax.*—It is well known that some of the inferior varieties of marble are acted upon by frost. A Mr. Henning, in London, has preserved several sculptured pieces, by causing them to imbibe wax. The stone and wax are both heated. [*Lond. Mech. Mag.*

*Steamboat Lexington.*—This boat, which ran, during the summer, between New York and Providence, making the passage by daylight, is dis-

cussed in the London Mechanics' Magazine, under the title of the "Fastest Ship in the World."

*Greenwich Railway Project.*—This extraordinary project is to carry a railway upon a viaduct from London to Greenwich, three and three-quarter miles, on a series of between 900 and 1000 arches. This *arcade* to be a series of shops.

*Action of Salt Water on Cast-iron.*—Sea water so alters the nature of cast-iron, that its cohesion appears to be quite destroyed. Cannon which have been fished up, after lying long in the sea, have been found converted, through their substance, into something resembling plumbago, and admitting of being cut with a knife. [*Mining Journal. Naut. Mag.*

*Statue of Brick and Mortar.*—A statue of the late king George the Fourth, erected at London, is built of bricks and mortar, coated, we presume, with cement. [*Loudon's Arch. Mag.*

*Whalebone Pen-holders.*—These holders for metallic pens are highly recommended for flexibility, by a correspondent of the London Mechanics' Magazine.

*Mineral Pitch Lake of Trinidad.*—This extraordinary body of mineral pitch is about half a mile in length, and a sixteenth of a mile in breadth. Numerous pools of water exist on its surface. The mineral is hard enough to bear the weight of a man of common size, unless when heated by the sun. It is unlike vegetable pitch, being allied to coal. It is used by the inhabitants of Trinidad for making roads, and cementing stones under water. Gas has been made from it. [*Jameson's Journal, from Webster's Voyage.*

*Canadian Twin Steamboat.*—A large steamboat is said to have been constructed at Prescott, Upper Canada, upon a principle similar to that of Mr. Burden, but with improvements. The thing will prove, probably, as little applicable to practice in the improvement, as in the original.

*Erection of the York Column.*—This monument, recently erected at London, to the Duke of York, is a Tuscan column, surmounted by a statue. The weight of the statue is 16,480 lbs., and it was raised to its place, 123 feet from the base of the column, in seven hours. It is said to have been greater in weight than any other statue raised to the same height in Great Britain.

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*List of American Patents which issued in March,* 1836.

| | | *March.* |
|---|---|---|
| 141. | *Rolling Dough and Cutting Crackers.*—Wm. R. Nivins, city of New York, | 2 |
| 142. | *Power Printing Press.*—Isaac Adams, Boston, Mass. | 2 |
| 143. | *Fire Place and Stove.*—Foster Stevens, Springfield, Mass. | 2 |
| 144. | *Heat, management of.*—Lovell Lewis, Lewistown, N. York, | 2 |
| 145. | *Washing Machine.*—John O. Geer, Norwich, Connecticut, | 2 |
| 146. | *Fire Proof Safe.*—Daniel Harrington, Philadelphia, | 2 |
| 147. | *Cask and Barrel Headings.*—Hiram Andrews, Canaan, Conn. | 2 |
| 148. | *Mill Stone Picks.*—Samuel Etheridge, Tecumseh, Mich. | 2 |
| 149. | *Boring Wood.*—John B. Bell, New York city, | 2 |
| 150. | *Piano Forte.*—Issac Clark, Cincinnati, O. | 2 |
| 151. | *Brick Press.*—Phineas Ball, Mount Vernon, O. | 2 |
| 152. | *Furnace and boiler combined.*—Alexander Harrison, New Haven, Conn. | 2 |
| 153. | *Saw Mills.*—Isaac Reed, Mansfield, Mass. | 2 |
| 154. | *Carriage and car axle.*—Spenser Coleman, Mount Pleasant, Va. | 2 |

155. *Dough Machine.*—D. D. and T. Shackford, West brook, Maine, 2
156. *Rotary stove caps.*—Maynard French, Albany, N. York, 2
157. *Feather Renovator.*—J. W. Post and R. Collier, Baltimore, Md. 2
158. *Churn.*—Amos Hanson, Windham, Maine, 2
159. *Printing Press.*—Samuel Kingsley, N. York city. 2
160. *Gauges, making.*—M. M. Brainard, Gt. Barrington, Mass. 4
161. *Pitch, composition.*—Thomas H. Sherman, Scriba, N. York. 4
162. *Gypsum applied to cisterns,* &c.—J. Flint and C. Mills, N. York city, 4
163. *Lever key and lock.*—Augustus Prutzman, Philadelphia, 4
164. *Rail road cars.*—T. Davis and W. Ashdown, Baltimore, 4
165. *Water Wheel.*—Fred. Wingate, Augusta, Maine, 4
166. *Plough.*—W. P. Cannon, Monroe co. Tenn. 4
167. *Rudder.*—Samuel Kepner, Harrisburg, Pa. 4
168. *Boots, turning.*—Pelatiah Stevens, Stoughton, Mass. 4
169. *Printing Press.*—Hezekiah Camp, Trenton, Ohio, 4
170. *Smoke, consuming.*—Nathan Lockling, Sparta, N. York, 4
171. *Cotton gin grates.*—Edwin Keith, Bridgewater, Mass. 4
172. *Plough.*—D. Prouty and J. Means, Boston, Mass. 4
173. *Propelling Wheel.*—Arctus A. Wilder, Warsaw, N. York, 8
174. *Pump, double force.*—Levi Newton, Alexander, N. York, 8
175. *Splint for fractures.*—Enoch Thomas, New Athens, O. 8
176. *Smut machine.*—M. B. Spafford, Gainsville N. York, 8
177. *Pot and pearl ash.*—Elijah Williams, Erie, Penn. 8
178. *Mould candles.*—Jefferson Dunlap, New Holland, Penn. 8
179. *Brick Machine.*—John Moffat, Buffaloe, N. York, 8
180. *Appling heat from lime,* &c.—Peter Werm, Philadelphia, 8
181. *Steam generator.*—Job Car, Springborough, O. 12
182. *Washing machine.*—Albion P. Arnold, Readfield, Maine, 12
183. *Forcing pump.*—William W. Lesuer, Venice, N. York, 12
184. *Water wheel.*—Abraham Straub, Milton, Penn. 12
185. *Bed bug destroyer.*—Brittain Garrard, Maysville, Tenn. 12
186. *Fire places.*—Elijah Skinner, Sandwich, N. H. 12
187. *Cooking stove.*—John Liddle, Schohaire, N. York, 12
188. *Door locks.*—Abel Corant, Lowell, Mass. 12
189. *Fire place.*—William Burgess, Middleborough, Mass. 12
190 *Cap wire.*—Melville Kelsey, N. York, 12
191. *Piano fortes.*—Henry Hartge, Baltimore, Md. 12
192. *Capstan.*—Andrew Morse, Boston, Mass. 12
193. *Cotton press.*—J. Mitchell, Ruthford, Tenn. 12
194. *Tooth extractor.*—Moses P. Hanson, Bangor, Maine, 12
195. *Paper, drying.*—Henry Howe, Shirley, Mass. 12
196. *Blacksmith's forge.*—Charles Richardson, Greenfield, N. H. 12
197. *Steam generator.*—John Ames, Springfield, Mass. 12
198. *Butt hinges,* &c.—Welcome Whittaker, Troy, N. York, 12
199. *Detaching horses.*—Phillip T. Shore, Baltimore, Md. 18
200. *Braces, gum elastic.*—Ransom Warner, New York, 18
201. *Making extracts.*—T. Close and J. C. Sandford, Rye, N. York, 18
202. *Cook stoves.*—Charles Vale, Newark, N. J. 18
203. *Tanning.*—Henry Locher, Lancaster, Penn. 18
204. *White lead, making.*—Homer Hollard, Westfield, Mass. 18
205. *Hemp breaking machine.*—John Pursell, Perryville, Ken. 18
206. *Serving ropes.*—Adam Montgomery, N. York, 18
207. *Salt, making.*—Richard K. Crallé, Lynchburg, Va. 18
208. *Metallic mill.*—Joseph C. Dentry, Dayton, O. 18
209. *Morticing machine.*—George Page, Keene, N. H. 18
210. *Feathers, dressing.*—Elam Wilbur, Geneva, N. York, 18
211. *Door lock.*—James McClory, N. York, 19
212. *Pitch, making.*—Henry Ruggles, N. York, 19
213. *Fire places.*—Wm. R. Prescott, Hallowhill, Maine, 19
214. *Steam Generator.*—Eliphalet Nott, Schenectady, N. York, 19
215. *Pen and pencil case.*—Henry Withers, N. York,

216. *Fore anvil block.*—Samuel Van Tiers, Hanover Iron Works, Penn. 19
217. *Boats, passing over dams.*—Stephen Underwood, Bath, N. H. 19
218. *Tanning.*—Laban Emery, N. York, 19
219. *Milk, preserving.*—John L. Granger, N. York, 19
220. *Cider mill.*—Christian Shaeffer, Lebanon, Penn. 19
221. *Cooking stove.*—Oren Wilson, Concord, Mass. 23
222. *Stove.*—Wm. M. Carmichael, Hempstead, N. Y. 23
223. *Shoe pegs.*—Reuben H. Thompson, Rochester, N. York. 23
224. *Cot bedsteads.*—Samuel Clark, N. York, 23
225. *Cask machine.*—Sumner King, Suffield, Conn. 23
226. *Dissolving caoutchouc.*—Patrick Mackie, N. York, 23
227. *Washing machine.*—E. Y. Watson, Albany, N. York, 23
228. *Cannon vent.*—John W. Cochran, Lowell, Mass. 23
229. *Cannon.*—John W. Cochran, Lowell, Mass. 23
230. *Mortising machine.*—Erastus M. Shaw, Wilbraham, Mass. 23
231. *Cotton roping.*—William Fowler, Fishkill, N. York, 23
232. *Straw cutter.*—James Hyde, Darien, N. York, 23
233. *Thrashing machine.*—Hugh and Isaac W. Edgar, Wayne co. Ohio, 23
234. *Rotary steam engine.*—David Ulam, Greenburgh, Penn. 23
235. *Boring stones.*—Andrew Turney, Reading, Conn. 30
236. *Bee hives.*—Sturgess M. Judd, Danbury, Conn. 30
237. *Forcing Pumps.*—John F. Rogers, Waterford, N. York, 30
238. *Power loom.*—Francois C. Lewis, Grafton, Mass. 30
239. *Mill.*—John Harman, Jr. York, Penn. 30
240. *Harness, rivetting.*—William Dukehart, Baltimore, Md. 30
241. *Water wheel.*—Carey S. Mercer, Franklin, Md. 30
242. *Wool spinning.*—John Wethered, Baltimore, Md. 30
243. *Cotton planter.*—Michael Beam, Buffalo, N. C. 30
244. *Lamp reflecting.*—John C. Fletcher, Springfield, Ohio, 30
245. *Hat block.*—W. W. Jeineson, Wheeling, Ohio, 30
246. *Joints in wood work.*—S. C. Batchelor, and N. S. Thomas, Watertown, N. Y. 30
247. *Wool spinner.*—Sykes and Conradt, Fredericktown, Md. 30
248. *Stove.*—John B. H. Swansey, Lynn, Mass. 30
249. *Hay, &c. press.*—A. R. Chamberlain and A. Cleflin, Richmond, Maine. 30
250. *Wind mill.*—Job Wilbur, Fall River, Mass. 30
251. *Axes, manufacturing.*—Elisha R. Root, Canton, Conn. 30
252. *Forcing pump.*—Nathan Chapin, Penn Yan, N. York, 30
253. *Cotton plough, &c.*—Harvey W. Pitts, Wilsonville, Al. 31
254. *Corn sheller.*—Abert W. Gray, Middletown, Ver. 31
255. *Springs for carriages, &c.*—Newell Hungerford, Ithaca, N. York, 31
256. *Awl Haft.*—David M. Smith, Gilsum, N. H. 31
257. *Soles, cutting.*—Jonathan Hill, Belerica, Mass. 31
258. *Reflecting ovens.*—C. D. Van Allen, Penn Yan, N. York, 31
259. *Self motive power.*—J. J. Giraud, Baltimore, Md. 31
260. *Churn.*—Thomas Nicholson, New Market, Va. 31
261. *Hoe, cast iron.*—Benj. F. Boyden, Boston, Mass. 31
262. *Winnowing machine.*—Jonathan Beane, Montville, Maine. 31
263. *Conveying water.*—Samuel Hart, Baltimore, Md. 31
264. *Tew irons.*—John Shugert, Elizabethtown, Penn. 31
265. *Mill stones, cooling.*—Austin Taylor, Littleton, N. H. 31
266. *Spark catcher.*—Wm. Shultz, Philadelphia, 31
267. *Horse power.*—Richard Skinner, Williamson, N. York, 31
268. *Cooking stove.*—B. R. Pearson, Warner, N. H. 31
269. *Hydrant.*—David Horne, Baltimore, Md. 31
270. *Rail plates.*—A. M. McCrane, Montgomery, Ala. 31
271. *Rail roads.*—Nathan Reed, Belfast, Maine, 31
272. *Cancer ointment.*—Elias Gilman, Licking, O. 31
273. *Gripe chuck.*—David Peeler, Boston, Mass. 31

## CELESTIAL PHENOMENA, FOR JULY, 1836.

*Calculated by S. C. Walker.*

| Day. | H'r. | Min. | | | | |
|---|---|---|---|---|---|---|
| 5 | 13 | 3 | Im. $\alpha$ Piscium, | ,5, | N. 155° | V. 106° |
| 5 | 13 | 55 | Em. | | 266 | 217 |
| 21 | 8 | 43 | N. App. ☽ and $\lambda$ Virginis, | ,4, ☽ S. 0'.5 | | |
| 24 | 8 | 28 | Im. A Ophinchi, | ,4,5, | 80 | 75 |
| 27 | 9 | 46 | Em. | | 253 | 262 |

## *Meteorological Observations for March, 1836.*

| Moon. | Days. | Therm. Sun rise. | Therm. 2 P.M. | Barometer. Sun rise. | Barometer. 2 P.M. | Wind. Direction. | Wind. Force. | Water fallen in rain. | State of the weather, and Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches | Inches | | | Inches. | |
| ☉ | 1 | 30° | 35° | 29.60 | 29.60 | S. SW. | Moderate. | | Sleet—rain. |
| | 2 | 32 | 23 | .73 | 30.00 | W. | Blustering | | Clear day. |
| | 3 | 30 | 28 | 30.06 | .10 | W. | Brisk. | | Lightly cloudy—clear. |
| | 4 | 26 | 44 | .03 | 29.90 | WSW. | Moderate. | | Clear day. |
| | 5 | 30 | 34 | 29.53 | .60 | SW. W. | Brisk. | | Clear—lightly cloudy. |
| | 6 | 21 | 34 | .80 | .53 | NE. N. | Blustering. | | Cloudy day. |
| | 7 | 29 | 41 | .73 | .73 | W. | do. | | Cloudy—flurry of snow. |
| | 8 | 29 | 39 | .68 | .68 | SE. W. | do. | | Cloudy—clear. |
| | 9 | 20 | 44 | .96 | .90 | NE. SE. | do. | | Clear—lightly cloudy. |
| ☾ | 10 | 29 | 38 | .80 | .55 | SE. | do. | | Fog—rain. |
| | 11 | 31 | 33 | .50 | .65 | W. | Blustering. | | Flying clouds. |
| | 12 | 13 | 23 | 30.05 | 30.15 | W. | Moderate. | | Clear day. |
| | 13 | 13 | 37 | .33 | .21 | NE. S. | Brisk. | | Clear—lightly cloudy. |
| | 14 | 40 | 44 | 29.10 | 29.85 | S. W. | Moderate. | | Partially cloudy. |
| | 15 | 27 | 39 | 30.25 | 30.23 | N W. | Brisk. | | Cloudy—clear. |
| | 16 | 32 | 38 | .40 | .40 | E. SW. | Moderate. | | Clear—lightly cloudy. |
| ⊗ | 17 | 32 | 38 | 29.80 | 29.70 | W. | do. | | Fog—cloudy. |
| | 18 | 44 | 40 | .70 | .90 | W. | Blustering | | Flying clouds—clear. |
| | 19 | 22 | 32 | .90 | 30.20 | W. | Light. | | Clear—cloudy. |
| | 20 | 24 | 36 | 29.95 | 29.95 | W. | do. | | Cloudy—clear. |
| | 21 | 29 | 44 | .95 | .86 | W. S. | do. | | Clear—cloudy. |
| | 22 | 31 | 35 | .55 | .55 | W. | Brisk. | | Flurry of snow—snow squall. |
| | 23 | 26 | 36 | 30.00 | 30.00 | W. | do. | | Clear day. |
| | 24 | 25 | 49 | 30.04 | .00 | SE. | do. | | Clear—cloudy. |
| | 25 | 25 | 42 | .15 | .20 | NW. | do. | | Clear—flying clouds. |
| | 26 | 20 | 38 | .35 | .40 | W. SE. | Moderate. | | Clear day. |
| | 27 | 27 | 50 | .32 | .10 | SW. | Brisk. | | Clear day. |
| | 28 | 25 | 44 | 29.90 | 29.90 | NW. | Calm. | | Cloudy—drizzle. |
| | 29 | 26 | 42 | 30.00 | 30.16 | N. E. | Moderate. | 0.25 | Cloudy day. |
| | 30 | 34 | 54 | .20 | .16 | E. | do. | | Flurry of snow—drizzle. |
| | 31 | 32 | 54 | .30 | .30 | W. SE. | do. | | Clear day. |
| | Mean | 27.26 | 39.58 | 29.94 | 29.94 | | | 0.25 | |

| Thermometer. | | Barometer. |
|---|---|---|
| Maximum height during the month, | 54. on 30th and 31st. | 30.40 on 16th & 26th. |
| Minimum do. | 13. on 12th and 13th. | 29.50 on 11th. |
| Mean do. | 33.42 | 29.94 |

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